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ABSTRACT

This publication is intended to do two things: reinforce reading skills essential to interpreting the exercises in the social studies, sciences, and mathematics sections of the test of General Educational Development (GED) and to provide students practice in interpreting passages written at a level of difficulty similar to the difficulty of the equivalency test. It is designed to be used as a supplement of "Developing High School Equivalency Reading Skills," which is a curriculum guide for teaching the reading skills needed to interpret the literature, social studies, science, and mathematics sections of the test. The reading passages in the first guide were selected to provide examples for purposes of instruction and are not as difficult as the GED test items, thus these passages for a more difficult reading level were developed. (MKM)

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CS 002 301

Extending

HIGH SCHOOL EQUIVALENCY

Reading Skills

Part 2 — Science, Social Studies, Mathematics

1975 Reprint

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Bureau of Continuing Education Curriculum Development
1973

THE UNIVERSITY OF THE STATE OF NEW YORK

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The publication entitled *Developing High School Equivalency Reading Skills*, which was distributed in the winter of 1972, has provided instructors with a basic tool for teaching the reading skills essential to interpreting the exercises found in the literature, social studies, science, and mathematics sections of the test of General Educational Development. For each reading skill that was identified as being critical there was provided a rationale for teaching the skill, an instructional objective, an instructional model, and a means of evaluating the student's acquisition of the skill. The instructional model was based on a reading passage which lent itself to developing a specific skill in a particular content area. However, as noted in that publication, the reading passages were selected solely to provide examples for purposes of instruction, and, as such their level of difficulty did not approach that of the passages found on the test of General Educational Development.

This publication, *Extending High School Equivalency Reading Skills, Part 2 - Science, Social Studies, Mathematics* is intended to fill the need for material which would both reinforce the skills taught and simultaneously provide students with practice in interpreting passages written at a level of difficulty more nearly commensurate with those which they will encounter on the equivalency test. Part 1 - *Literature*, developed for the same purposes, and distributed in the spring of 1973, contained reading selections from nonfiction, fiction, poetry and drama.

Bringing to fruition a curriculum supplement of such demanding specifications has necessitated the joint efforts of a number of educational specialists who served as members of the High School Equivalency Reading Project Team during its second phase of operation. In varying capacities, each of the following individuals served as members of that team.

- Gerald J. Cerne
  Instructor in Biology, Colonie Central High School, contributed the material for the science strand.

- Virginia A. Rovelli
  Supervisor of Reading, Ballston Spa Public Schools, contributed much of the material used in the items pertaining to vocabulary.

- Eugene E. Webster
  Instructor in Social Studies, Bethle
  contributed the material for the soc

- George K. Tregaskis
  Associate, Bureau of Continuing Educ
  Development, directed the efforts o
  the final manuscript for publicatio

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was reviewed by Fredric Paul, associat
Mathematics Education; Donald H. Brag
Social Studies Education, and members
Jane Algozzine, Chief, Bureau of Readi
members of her staff.

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GORDON E. VAN HOOFT, *Director*
Division of Curriculum Development

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of that team.

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strand.

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the items pertaining to

- Eugene E. Webster
  Instructor in Social Studies, Bethlehem High School, contributed the material for the social studies strand.

- George K. Tregaskis
  Associate, Bureau of Continuing Education Curriculum Development, directed the efforts of the team and prepared the final manuscript for publication.

During various stages of its development, the manuscript was reviewed by Fredric Paul, associate, Bureau of Mathematics Education; Donald H. Bragaw, Chief, Bureau of Social Studies Education, and members of his staff; and Jane Algozzine, Chief, Bureau of Reading Education, and members of her staff.

HERBERT BOTHAMLEY, *Chief*
Bureau of Continuing Education Curriculum Development

GORDON E. VAN HOOFT, *Director*
Division of Curriculum Development

MESSAGE TO THE INSTRUCTOR

Experienced and successful instructors of High School Equivalency students realize the value of building into their programs exercises in reading that require a type and a level of interpretation similar to that which is demanded by the test of General Educational Development. The intent of this publication is to provide such exercises in vocabulary and in the content areas of science, social studies, and mathematics.

A previous publication entitled *Developing High School Equivalency Reading Skills* outlined the reading skills identified as being critical to achieving minimum high school equivalency competencies. Detailed suggestions for teaching those skills were also included in that publication. Whereas this second publication is designed to extend or reinforce those skills, and not develop them, it is strongly recommended that the instructor delay using these exercises until he is satisfied that his students have acquired sufficient mastery of the skills to assure a degree of success in answering the assessments of comprehension.

Several criteria, other than being representative of a particular content area, influenced the selection of exercises included in this publication. First, and of top priority, the exercise has to lend itself to the application of one of the skills identified in the interpretation of science, social studies, or mathematics. In this respect it will be noted that all the exercises are keyed to the skills cited in the previous publication, and one or more of the assessments for each exercise have been written to test specifically for that skill for which the exercise was chosen.

Secondly, the reading level of each exercise had to approximate that of the exercises found in the test of General Educational Development. Concept density and sophistication, use of figurative language and imagery, literary merit, and to a lesser extent, vocabulary and sentence length were all considered in reaching this decision. Though necessitating somewhat more arbitrary judgments than those that could have been made based on the information obtained by the application of readability formulas, the aforementioned factors which were weighed were considered to be of greater consequence.

Thirdly, an attempt was made to incl
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Mary L. Reiss, *Director*
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Thirdly, an attempt was made to include selections which reflected a variety of ethnic experiences, historical and contemporary writings; and the urban and the rural scene.

In some cases representative excerpts from newspapers were used. If the students show considerable interest in these excerpts, especially editorials, the instructor might consider developing other readings dealing with more current issues.

A companion anthology of reading exercises to extend the High School Equivalency reading skills necessary for interpreting the literature strand of the test of General Educational Development is also available from the Bureau of Continuing Education Curriculum Development.

JOSEPH A. MANGANO, *Chief*
Bureau of General Continuing Education

Mary L. Reiss, *Director*
Division of Continuing Education

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Note:

All page numbers, titles of areas, and ti
have been printed at the outer margins.
it possible for the instructor to quickly
simply "thumbing" the pages.

The key for entries of reading exercises
is as follows:

Conflict Abroad 1/2
(Title) (Page 1 of 2 pages)

The key for entries of reading exercises
is as follows:

SS4 Conflict Abroad

	Page
. . . . .	iii
. . . . .	iv
in Science.	vi
Assessments of	30
in Social Studies . . .	31
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athematics.	59
. . . . .	65

Note:

All page numbers, titles of areas, and titles of reading exercises have been printed at the outer margins. This arrangement makes it possible for the instructor to quickly locate any item by simply "thumbing" the pages.

The key for entries of reading exercises on odd numbered pages is as follows:

Conflict Abroad	1/2	SS4
(Title)	(Page 1 of 2 pages)	(Social Studies, 4th selection)

The key for entries of reading exercises on even numbered pages is as follows:

SS4	Conflict Abroad	1/2

The selection...	*entitled....*	*begins on page....*	*and provides reinforcement in....*
S1	Verminous Dermatitis	1	using characteristic roots and affixes and structural similarities found in technical terms
S2	The Cathode Ray Tube	2	using characteristic roots and affixes and structural similarities found in technical terms
S3	Nuclear Energy	3	using context clues
S4	Soil Formation	5	general vocabulary used in a special sense
S5	Causes of Disease	7	specialized vocabulary
S6	Grow a Forest in 3 Years	8	identifying the main idea by direct statement
S7	Control of Insects	10	inferring the main idea
S8	Nuclear Safety	12	relating details to main idea
S9	The Age of Rock Layers	14	relating details to details
S10	The Fuel Cell	16	identifying emphases and relating illustrations to the text
S11	The Ovulation Cycle in Hens	18	identifying basis for organization
S12	Soil Reaction and Liming	20	inferring scientific generalizations
S13	Solar Radiation	22	relating maps and diagrams to the text
S14	The Nuclear Rocket	25	relating graphs to the text
S15	Activation Analysis	27	relating tables to the text
S16	Chemical Batteries	29	relating chemical formulas to the text

(CORRECT RESPONSES TO ASSESSMENTS OF COMPREHENSION *found on page 30*)

The only truly parasitic worm known to cause a specific dermatitis, or skin disease, of cattle in the United States is a small filarial roundworm, *Stephanofilaria stilesi*.

The adult worms live and move about in the outermost, or epithelial, layer of the skin. Their progeny, known as larvae or microfilariae, are found mostly in the upper part of the underlying dermal skin layer.

The life cycle of the parasite has not been worked out, but an insect intermediate host probably is required for its completion. Transmission by one or more of the many kinds of sucking insects that attack cattle is strongly suggested by the life cycles determined for related filarial roundworms. Such dipteran insects as flies, "midges," and mosquitoes head the list of suspects.

The causative parasite has been found only in lesions in the skin of cattle. Presumably the intermediate host inoculates the skin with the infective larvae of the parasite. The irritation produced as they develop into adults apparently starts the lesions. An alternative possibility is that the transmitter is attracted to already existing sores or breaks in the skin and inoculates infective larvae into them. At any rate, the presence of the adults and their microfilariae causes tissue destruction.

Stephanofilariasis, also known as stephanofilarial dermatitis, and stephanofilarial dermatosis, the skin disease caused by this parasite, was first recognized in western cattle in 1934. It seems to be more common in beef cattle than in dairy cattle. When it becomes established in a herd, up to 90 percent of the animals may be affected. Stephanofilariasis has been observed mainly in mature cattle but younger cattle sometimes are affected. Lesions suspected to be of stephanofilarial origin have been found on calves about 6 months old.

Assessment of Compreh

1. If dermatitis is a disease of the s
assume that dermatology is a branch
that is concerned with conditions c

   1. insects
   2. cattle
   3. parasites
   4. the skin

2. If the prefix *para* means beside or
parasite refers to an organism that

   1. can fly
   2. lives on or in another organism
   3. causes stephanofilariasis
   4. acts as an intermediate host

3. The number two is sometimes represe
prefix *di*. The term *dipteran* in th
order of insects that has

   1. no wings
   2. two wings
   3. three wings
   4. four wings

4. Stephanofilariasis or stephanofilar
caused by

   1. a roundworm
   2. mosquitoes
   3. flies
   4. cattle which act as an interme

nown to cause a specific
cattle in the United States is
phanofilaria stilesi.

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old.

Assessment of Comprehension

1. If dermatitis is a disease of the skin then one could assume that dermatology is a branch of medical science that is concerned with conditions of

   1. insects
   2. cattle
   3. parasites
   4. the skin

2. If the prefix *para* means beside or near by, then the word parasite refers to an organism that

   1. can fly
   2. lives on or in another organism
   3. causes stephanofilariasis
   4. acts as an intermediate host

3. The number two is sometimes represented in words by the prefix *di*. The term *dipteran* in the text refers to an order of insects that has

   1. no wings
   2. two wings
   3. three wings
   4. four wings

4. Stephanofilariasis or stephanofilarial dermatosis is caused by

   1. a roundworm
   2. mosquitoes
   3. flies
   4. cattle which act as an intermediate host

Before 1350 much had been learned about the behavior of electric charge and electric currents flowing through solids and liquids. Real progress in understanding electric charge, however, had to wait for the development of highly efficient vacuum pumps.

In 1854 Heinrich Geissler, a German glassblower, developed an improved suction pump, and also succeeded in sealing into a glass tube two wires attached to metal electrodes inside the tube. Experimenters were then able to study the flow of electricity through a near-vacuum. A Geissler tube is diagrammed in Figure 1.

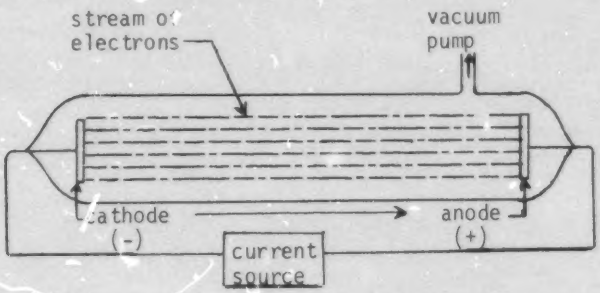

Figure 1

By the 1890's it had become clear that the flow of electricity through a highly evacuated tube consisted of a negative electric charge moving at a very high speed along straight lines between sealed-in electrodes. Since it originated at the negative electrode, or cathode, the invisible stream of charge was named "cathode rays."

Although many investigators contributed to knowledge about cathode rays, the experiments of J. J. Thomson, a British physicist, are generally considered to have been the most enlightening. Thomson arranged a cathode-ray tube so that the rays could be deflected by magnets and by electrically charged metal plates. By applying certain well-known principles of physics, he was able to confirm an impression already held by physical chemists, namely, that electric charge, like matter, was "atomized," that the stream of charge consisted of a swarm of very small particles, all alike. He succeeded also in determining that the speed of the particles was about one-tenth the speed of light.

Probably Thomson's most significant
ratio of the charge of each little
was able to do this by measuring th
divert a stream of charged particle
ratio proved to be nearly 2000 time
known charge-to-weight ratio for a
atom, or ion, which until then was
constituent of matter. It remained
charge or weight caused the differe
showed that the charges involved we
the two cases. It was therefore pr
hydrogen atom, lightest of all the
as great as the weight of one of th

The name "electron" was given to th
identified by Thomson. Since the e
cathode, it was apparent that the a
contain electrons. Thomson reasone
a wire is a stream of electrons pas
to atom and that the difference bet
atom and a neutral atom is that the
lost one or more electrons.

Assessment of Co

1. If the prefix cath (as in catho
both have a connotation of down
meaning of up would be

   1. ana (as in anode) and posit
   2. electro (as in electrode) a
   3. chem (as in chemist) and po
   4. hydro (as in hydrogen) and

2. Which term is not related to th

   1. electric
   2. electrode
   3. electron
   4. elect.on

3. Electrons are emitted from the

   1. anode
   2. cathode
   3. vacuum electrode
   4. positive electrode

learned about the behavior of
ric currents flowing through solids
ss in understanding electric
ait for the development of hi hly

, a German glassblower, developed
and also succeeded in sealing
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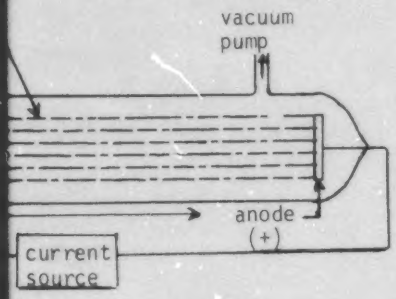

Figure 1

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Probably Thomson's most significant result was determining the ratio of the charge of each little particle to its weight. He was able to do this by measuring the magnetic force required to divert a stream of charged particles. This charge-to-weight ratio proved to be nearly 2000 times greater than the already known charge-to-weight ratio for a positively charged hydrogen atom, or ion, which until then was thought to be the lightest constituent of matter. It remained to be determined whether charge or weight caused the difference. Further experimentation showed that the charges involved were approximately the same in the two cases. It was therefore proven that the weight of the hydrogen atom, lightest of all the atoms, was nearly 2000 times as great as the weight of one of the little negative particles.

The name "electron" was given to the small negative particles identified by Thomson. Since the electrons had come from the cathode, it was apparent that the atoms in the cathode must contain electrons. Thomson reasoned that electrical current in a wire is a stream of electrons passing successively from atom to atom and that the difference between an electrically charged atom and a neutral atom is that the charged one has gained or lost one or more electrons.

Assessment of Comprehension

1. If the prefix cath (as in cathode) and the word negative both have a connotation of down, then the terms relating the meaning of up would be

   1. ana (as in anode) and positive
   2. electro (as in electrode) and ana (as in anode)
   3. chem (as in chemist) and positive
   4. hydro (as in hydrogen) and electro (as in electrode)

2. Which term is not related to the others

   1. electric
   2. electrode
   3. electron
   4. election

3. Electrons are emitted from the Geissler tube through the

   1. anode
   2. c thode
   3. acuum electrode
   4. positi e electrode

Soon after the discovery of radioactivity at the end of the 19th century, physicists began to conjecture about the energy, which they called "atomic energy," apparently stored within the atom. Later, when the nuclear theory of the atom was developed in 1911, it was realized that it was the central part of the atom, the nucleus, that was the source of this energy. Hence, it should, more correctly, be referred to as "nuclear energy." Until 1939, however, it was not known how this energy could be released in a useful manner.

In the course of his studies in 1905 on the theory of relativity, Albert Einstein showed that mass and energy were, in a sense, equivalent. Consequently, energy should be liberated in any process associated with a net decrease in mass. By considering the measured masses of atomic nuclei, it became apparent that there were two ways in which nuclear energy could be made available. One is by splitting (or *fission*) of the heaviest nuclei into two roughly equal parts, and the other is by the combination (or *fusion*) of some of the lightest nuclei. Actually, there are many other nuclear processes which are accompanied by a liberation of energy. But only with nuclear fission and fusion is there a possibility of producing more energy than is consumed in causing the reaction to occur. In other words, there is some prospect that the process, once started, can be self-sustaining like a fire.

The discovery of nuclear fission in 1939 revealed a new and highly concentrated source of energy. Some six years later, this energy was first utilized in the atomic bomb, and since that time nuclear reactors have been developed in which fission is converted into useful heat and then into electric power.

But fission is not the complete solution to the energy problem. It is true that the world resources of the basic materials, namely uranium and thorium minerals, are fairly abundant. Nevertheless, there are many countries that either do not possess these minerals or do not have the means for producing the best nuclear fuels from them.

It is such considerations that make nuclear fusion of exceptional interest as a possible source of power. The essential fuel material is a form (isotope) of hydrogen, called "heavy hydrogen" or *deuterium*, that is present in all water; for every 6500 or so atoms of ordinary (or light) hydrogen in water, there is one atom of deuterium. Calculations show that the energy that could, in theory, be produced by the fusion of the deuterium nuclei present in a gallon of water is equal to that obtainable

from the combustion of 300 gallons of
amounts of water available on earth th
inexhaustible potential source of ene

The cost of obtaining the deuterium fu
large. At the present, it costs about
the deuterium in a gallon of water.
operative, even at a low efficiency,
be insignificant. Here then is appare
of energy—cheap, abundant, and availa
unfortunately, this is not the whole s
as in a nuclear fission system, the pr
represent only a small portion of the
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problems to be solved before fusion po

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make nuclear fusion of exceptional
of power. The essential fuel
f hydrogen, called "heavy hydrogen"
in all water; for every 6500 or
) hydrogen in water, there is one
ns show that the energy that
by the fusion of the deuterium
water is equal to that obtainable

from the combustion of 300 gallons of gasoline. The enormous amounts of water available on earth thus represent a virtually inexhaustible potential source of energy.

The cost of obtaining the deuterium fuel from water is not large. At the present, it costs about 4 cents to extract all the deuterium in a gallon of water. If the fusion process were operative, even at a low efficiency, the fuel costs would thus be insignificant. Here then is apparently the ideal source of energy—cheap, abundant, and available to all. But, unfortunately, this is not the whole story. For one thing, as in a nuclear fission system, the price of the fuel would represent only a small portion of the cost of the electric power produced. For another, there are tremendously difficult problems to be solved before fusion power can be a reality.

Assessment of Comprehension

1. Combining nuclei and releasing nuclear energy occurs during the process of

   1. fission
   2. fusion
   3. atomic bomb detonation
   4. heat transfer

2. A self-sustaining process is one that

   1. separates hydrogen atoms
   2. only involves nuclear reactions
   3. uses more energy than it produces
   4. releases more energy than it consumes

3. This is an isotope of hydrogen:

   1. uranium
   2. thorium
   3. deuterium
   4. water

4. Albert Einstein reasoned that

   1. fusion provides enough energy to burn 300 gallons of gasoline
   2. heavy hydrogen in water makes it unfit to drink
   3. the cost to extract deuterium from water would be low
   4. mass and energy were related

5. This nuclear term means splitting:

   1. fission
   2. fusion
   3. self-sustaining
   4. radioactivity

6. The nuclear theory was developed in

   1. 1905
   2. 1911
   3. 1939
   4. 1945

7. The source of nuclear fuel used in fusion is

   1. gasoline
   2. water
   3. uranium
   4. thorium

The weathering of rocks provides soil parent materials. Solid rocks disintegrate slowly under the influence of climate, which acts on them through sunshine, rain, frost, and wind. Heating and cooling, freezing and thawing, wetting and drying all tend to weaken the rock structure. The minerals in rocks react with water and air that enter through tiny cracks and crevices. Changes in the minerals then set up stresses and strains, which further weaken the rock structure.

The final effect of these forces is to break up a rock into small pieces, often into the constituent mineral grains. Gradually rocks thus disintegrate and decay. The loose and weathered rock materials may then become soil parent materials. As used here, parent rock means rock that is still solid and massive, whereas soil parent material is the disintegrated rock at or near the present land surface.

Tremendous quantities of rocks have been weathered during the millions of years that have passed since the continents took form. A mantle of weathered rock, known as the regolith, now blankets the land surface generally. This regolith has been formed in some places by disintegration and decomposition of rocks on the spot. In many more places it has been moved about by water, wind, or ice.

The regolith may be slightly weathered and consist of fresh primary minerals, as it does in recent deposits left by glaciers in Alaska. It may be intensely weathered so that nothing but highly resistant minerals remain, as is true in parts of central Brazil. The wide range in degree of weathering is matched by similar ranges in composition of the regolith and in its thickness to hard rock. The composition and thicknesses are important to soil formation. The nature of the original rock and the stage of weathering of the regolith also affect the fertility and water relationships of soils.

Plants soon gain a foothold in the regolith. Sometimes they begin growing on rock before it has disintegrated. The pioneers are commonly simple forms such as lichens. Micro-organisms, such as bacteria and fungi, also are early invaders. Larger and more complex plants soon follow. Small animals then join the biological community in the infant soil.

As these organisms grow and die, their bodies are left on and in the regolith. Parts of dead plants fall to the surface. Roots are left within the weathering rock mass. The addition and decay of organic matter gradually change the character and appearance of the surface layer of the regolith. It begins to differ from the deeper layers.

Horizons are formed in soil profiles b
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The regolith, as a whole, gains some t
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Organic matter is usually added to the
quantities than to deeper ones. Clay
lost from the surface layer and accumu
Minerals decompose slowly all the time
decays rapidly. Minerals in the regol
water or with each other to form new c
effects of these gains, losses, and al
slowly but constantly, differentiate h

Assessment of Compreh

1. *Soil parent material* refers to

   1. disintegrated rock
   2. decayed plants
   3. the climate
   4. Alaskan glaciers

2. The phrase, *A mantle of weathered r*

   1. cracks in rocks
   2. rocks covering the surface
   3. minerals from Brazil
   4. organic matter above the regol

3. The nature and the extent of weath
   rock affects the

   1. climate
   2. wind
   3. soil's fertility
   4. glaciers

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lly change the character and
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rs.

Horizons are formed in soil profiles because of gains, losses, and alterations. Gains in organic matter are an early step in the differentiation of horizons in most soils.

The regolith, as a whole, gains some things and loses others. Changes in its composition go on all the time. The kinds and rates of changes are not the same throughout the regolith. Substances being gained or lost are not identical in the different parts of the vertical section.

Organic matter is usually added to the surface layer in greater quantities than to deeper ones. Clay and sesquioxides may be lost from the surface layer and accumulate in deeper ones. Minerals decompose slowly all the time, and organic matter decays rapidly. Minerals in the regolith react with air and water or with each other to form new compounds. The combined effects of these gains, losses, and alterations, going on slowly but constantly, differentiate horizons in soil profiles.

Assessment of Comprehension

1. *Soil parent material* refers to

   1. disintegrated rock
   2. decayed plants
   3. the climate
   4. Alaskan glaciers

2. The phrase, *A mantle of weathered rock*, refers to

   1. cracks in rocks
   2. rocks covering the surface
   3. minerals from Brazil
   4. organic matter above the regolith

3. The nature and the extent of weathering of the parent rock affects the

   1. climate
   2. wind
   3. soil's fertility
   4. glaciers

4. The layer of disintegrated and decomposed rocks on the land's surface is called the

   1. organic strata
   2. horizon
   3. regolith
   4. deposit

5. Lichens are thought of as

   1. pioneer organisms
   2. bacteria
   3. small animals
   4. complex plants

6. Organic matter is built up in the soil as a result of the accumulation of

   1. minerals
   2. glaciers
   3. deposits
   4. remains of organisms

7. In soil profiles the different strata are referred to as

   1. organic minerals
   2. regoliths
   3. deposits
   4. horizons

8. The greatest quantity of organic matter in a soil is usually found

   1. in clay
   2. in glacial deposits
   3. at the surface
   4. at the lowest horizon

Bacteria and viruses enter an animal's body through the skin and the organs of breathing, digestion, and sex. They may multiply, attack the tissues, and produce disease.

Or they may not: The body makes strenuous efforts to repel the invaders.

Two forces wage a ceaseless struggle—the disease-producing agent and the animal itself, the host.

If the infecting agent is to invade the tissues of a host successfully, it must have enough virulence to overcome the body defenses. It must be able also to multiply actively, thereby producing a disease process, or to survive in an inactive state, the carrier stage, until conditions are right for multiplication or until it escapes from the host and becomes infectious to other animals.

The host is protected within limits by a barrier known as immunity or resistance. Resistance is relative. It varies considerably among individual animals. In some animals it may be quite strong; in others, weak or lacking.

The infective agent is influenced greatly by its surroundings within or outside the animal host. Its invading ability is determined largely by its environment. Certain species of animals are highly resistant to certain types of infection. The resistance of cattle to glanders, a disease of horses, is an example. In the species susceptible to a specific infection, however, there is a wide variation in susceptibility and resistance among individuals.

Resistance—immunity—to a disease process may be built up in certain animals to an appreciable extent by natural contact with limited amounts of infection in the field and also by artificial procedures, such as vaccination. And to the same vaccination procedure, there is wide variation in the immunity response of individual animals.

If the infecting agent overcomes the body's defenses, the host animal acquires an infection. We say that such an animal has become sick or diseased.

The symptoms of disease may be accompanied by certain structural changes, known as lesions, in the organs or tissues involved in the disease process. The lesions may be visible, or they may be so minute that they can be detected by a pathologist only with the aid of a microscope.

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Bacteria are microscopic organisms of v
They are found everywhere in nature. S
disease. Those that can are known as p
bacteria. Diseases, such as tetanus (l
are caused by bacteria. Those that do
saprophytes, or nonpathogens.

Viruses are ultramicroscopic—that is t
under the ordinary high-power microscop

Assessment of Comprehen

Match the terms on the left with the de
Use letter answers in the space provide

A. saprophytes
B. pathogens
C. immunity
D. ultramicroscopic
E. lesions
F. vaccination
G. infection
H. carrier stage

1. a method used
2. bacteria that
   disease
3. disease organ
   in an inact
4. an organism's
   disease
5. produced when
   defenses ar
6. disease produ
7. changes in di
8. unable to be
   microscope

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Bacteria are microscopic organisms of various types and shapes. They are found everywhere in nature. Some of them can produce disease. Those that can are known as pathogens, or pathogenic bacteria. Diseases, such as tetanus (lockjaw) and diphtheria are caused by bacteria. Those that do not produce disease are saprophytes, or nonpathogens.

Viruses are ultramicroscopic—that is they cannot be seen under the ordinary high-power microscope.

Assessment of Comprehension

Match the terms on the left with the definitions on the right. Use letter answers in the space provided.

A.	saprophytes	1. a method used to induce immunity	___
B.	pathogens	2. bacteria that do not produce disease	___
C.	immunity	3. disease organisms in the host in an inactive state	___
D.	ultramicroscopic	4. an organism's protection from disease	___
E.	lesions	5. produced when the host's body defenses are overcome	___
F.	vaccination	6. disease producing organisms	___
G.	infection	7. changes in diseased tissues	___
H.	carrier stage	8. unable to be seen under a light microscope	___

Harvesting trees for pulpwood every 2 to 3 years—compared to the present 20 to 40 years—is a revolutionary new concept being explored by forestry scientists. It holds promise of helping the United States and other nations meet growing needs for timber, pulp, and other wood-based products. And costs would be greatly reduced.

The new system, called "silage sycamore," consists of planting sycamore trees at a very close spacing and then harvesting crops of sprouts with a silage cutter every 2 to 3 years. Time and space savings result compared to conventional wide-spaced tree plantations for pulpwood or other wood products. And higher yields of wood fiber per acre of land are expected. At present, trees are harvested for pulpwood every 20 to 40 years.

Regeneration of forests by sprouts is not new. Willow shoots have been grown for basket weaving since the dawn of civilization. But bulk production of fiber or cellulose, by harvesting young sprout growth of trees, would be a real innovation. What is needed for a 2- or 3-year forest is a tree that sprouts vigorously and that has the fiber properties sought by industry to make reconstituted products like particleboard and paper.

Ten years of sycamore studies by the U.S. Forest Service proved the great versatility of that species. It occurs naturally in all States east of the Great Plains except Minnesota and grows on a wide range of soils and sites. Under reasonably good sunlight, soil, and moisture conditions, sycamore grows fast. It sprouts prolifically from a low stump and responds well to fertilization. Then too, it has relatively few insect and disease enemies in the South.

In the beginning, the new forest is to be planted on a well-prepared site by using seed, seedlings, or cuttings. Use of cuttings is particularly attractive since genetic gains are realized quickly; superior stock can be selected in 1 or 2 years and reproduced vegetatively. Mechanical weed control and cultivation improve survival, and growth. Repeated cropping will require fertilizer applications, and intensive management may call for irrigation. Possibly both irrigation and fertilization can be accomplished by applying discharges from sewage treatment plants to the forest crop.

Experimentation so far suggests that
equal the square of as many feet as
harvest interval. For example, in a
year cutting cycle, the trees would
initially. The close spacings make
immediately. In conventional planti
spacings, the tree crowns do not ful
several years.

Two-year-old rootstocks in a nursery
1 foot apart in 4-foot rows produced
tons of 1-year-old sprouts per acre.
harvested after 6 years, only a few
growth was drastically reduced durin
end of 6 years, 42 tons of green mat
This equals 7 tons or a respectable
However, if the sprouts had been har
the total yield probably would have
or about 2 1/2 times the total of the

Assessment of Compreh

1. The main concern of this passage

   1. growing trees for pulpwood
   2. ancient use of tree sprouts
   3. the new idea of harvesting tr
   4. the use of sewage treatment p
      fertilization

2. Using the "silage sycamore" syste
   harvested every 2 years should be
   area of

   1. 2 square feet
   2. 4 square feet
   3. 9 square feet
   4. 64 square feet

3. Mechanical weed control and culti

   1. an improvement in survival and
   2. the decreased production of f
   3. the need to introduce insect a
   4. the need to use the convention

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Experimentation so far suggests that initial growing space should equal the square of as many feet as there are years in the harvest interval. For example, in a planting designed for a 3-year cutting cycle, the trees would be given 9 square feet initially. The close spacings make full use of the site almost immediately. In conventional plantings at 8- by 8-foot or wider spacings, the tree crowns do not fully shade the ground for several years.

Two-year-old rootstocks in a nursery planting of sycamore placed 1 foot apart in 4-foot rows produced an average of more than 17 tons of 1-year-old sprouts per acre. When a similar planting was harvested after 6 years, only a few of the trees had died, but growth was drastically reduced during the last 4 years. At the end of 6 years, 42 tons of green material were produced per acre. This equals 7 tons or a respectable 2.3 cords per acre per year. However, if the sprouts had been harvested each year for 6 years, the total yield probably would have exceeded 100 tons per acre or about 2 1/2 times the total of the single cutting.

Assessment of Comprehension

1. The main concern of this passage is

   1. growing trees for pulpwood
   2. ancient use of tree sprouts
   3. the new idea of harvesting trees every few years
   4. the use of sewage treatment plants for irrigation and fertilization

2. Using the "silage sycamore" system, trees that are to be harvested every 2 years should be provided with a growing area of

   1. 2 square feet
   2. 4 square feet
   3. 9 square feet
   4. 64 square feet

3. Mechanical weed control and cultivation result in

   1. an improvement in survival and growth of the crop
   2. the decreased production of fiber and cellulose
   3. the need to introduce insect and disease enemies
   4. the need to use the conventional 64 square feet spacings

4. In the experiment using sycamore trees planted 1 foot apart in 4-foot rows, the average production per acre the first year was

   1. 7 tons
   2. 17 tons
   3. 42 tons
   4. 100 tons

5. In conventional plantings the area given each tree is at least

   1. 1 square foot
   2. 4 square feet
   3. 9 square feet
   4. 64 square feet

6. In order to maintain a high yield, repeated harvesting of sycamore sprouts would require

   1. conventional planting
   2. the use of insect enemies
   3. a time span of 20 to 40 years between cuttings
   4. the use of fertilizers

7. For centuries, baskets have been woven from

   1. particleboard
   2. pulpwood
   3. willow shoots
   4. sycamore trees

Insects are man's greatest competitor for food and fiber and the transmitters of such ancient pestilences as malaria, sleeping sickness, yellow fever, and bubonic plague. These threats to our public health and agricultural abundance are held in check only through the energy and determination of the entomologist and the imagination and versatility of the organic chemist.

Discovery and application of the insecticidal nature of DDT in 1939 was a major breakthrough in the development of organic pesticides. So effective was DDT in early studies that many predicted the eventual eradication of several insect species. However, they did not reckon with the ability of insects to develop resistance.

Heavy use of this insecticide resulted in the appearance of strains of insect pests resistant to DDT.

Undaunted, the organic chemists proceeded to synthesize the chemical relatives of DDT and other chemicals, some of which were even more toxic to insects than DDT.

Toxicants such as the organophosphorus and carbamate insecticides were discovered which provided the farmer and the public health official with undreamed of weapons against the insect hordes. Inexorably, however, the insects retaliated with their extensive capacity to evolve strains resistant to most or all insecticides.

Recently, the development of more precise and sensitive methods of analysis for pesticide residues has revealed a remarkable and disturbing persistence of some of these chemicals in our environment.

Unhappily, most pesticides are not only toxic to insects, but to other animals and man as well. Concern about our environmental health and wildlife, and the problem of increasing insecticide resistance requires a new approach to insect control. The agricultural and health demands of our society now will not permit a return to pre-DDT (1939) methods of control.

Thus, more fundamental approaches to insect control must be found. The biological, biochemical, and behavioral differences which set insects apart from other animals must be sought after, understood, and taken advantage of. A substantial investment in the study of insect life history, feeding, growth, developmen made in order to understand the func insects and other animals.

This will permit the development of control uncomplicated by eventual in potential hazard to human population

One such approach to insect control rapidly expanding knowledge of how i regulate their growth, feeding, mati diapause—a state akin to hibernatio of the complicated development of in butterflies marked by the growth of goes through several stages, molts t winged adult. Each step of this inv is carefully regulated by hormones. the hormone-producing machinery know can cause an immature insect to stop or molt into monsters that are inter pupa or half pupa and half adult. N result in the insect's premature dea

Assessment of Compre

1. Man's greatest competitor is

   1. insects
   2. DDT
   3. larva
   4. bubonic plagues

2. The main concern of this passage

   1. how insects develop
   2. the use of DDT
   3. the use of chemical and biol insects
   4. to trace the development of

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This will permit the development of selective tools for insect control uncomplicated by eventual insect resistance and the potential hazard to human populations.

One such approach to insect control is the application of our rapidly expanding knowledge of how insects rely upon hormones to regulate their growth, feeding, mating, reproduction, and diapause—a state akin to hibernation. Nearly everyone is aware of the complicated development of insects such as moths or butterflies marked by the growth of a tiny hatchling larva which goes through several stages, molts to a pupa, and finally to a winged adult. Each step of this involved scheme of development is carefully regulated by hormones. Experimental tampering with the hormone-producing machinery known as the endocrine glands can cause an immature insect to stop developing, grow too fast, or molt into monsters that are intermediate between larva and pupa or half pupa and half adult. Nearly all these effects result in the insect's premature death.

Assessment of Comprehension

1. Man's greatest competitor is

   1. insects
   2. DDT
   3. larva
   4. bubonic plagues

2. The main concern of this passage is

   1. how insects develop
   2. the use of DDT
   3. the use of chemical and biological methods of controlling insects
   4. to trace the development of ancient pestilences

3. The use of many organic chemicals as insecticides has proven to be ineffective because

   1. pre-DDT methods are best
   2. insects have evolved resistance to these chemicals
   3. the larva feed on these chemicals
   4. the endocrine glands use these organic chemicals to manufacture hormones

4. The growth, feeding, reproduction, and diapause of many insects are under the control of

   1. DDT
   2. organophosphorus
   3. insecticides
   4. hormones

5. When strains of insects developed resistance to DDT, chemists reacted by

   1. producing other organic insecticides
   2. banning DDT
   3. developing sensitive methods of analyzing DDT residues
   4. returning to pre-DDT methods

6. The sequence of stages in the development of moths is

   1. egg-larva-pupa-adult
   2. adult-larva-pupa-egg
   3. pupa-larva-egg-adult
   4. larva-adult-pupa-egg

7. Endocrine glands produce

   1. pesticides
   2. carbamate insecticides
   3. hormones
   4. toxicants

8. A more recent and fundamental approach to insect control involves the study of

   1. insect life history
   2. ancient pestilences
   3. pre-DDT methods
   4. the eradication of insects

The subject of nuclear safety is separate and distinct from reactor shielding. Nuclear-safety analysis anticipates accidents that might occur during transportation, launch, and operation in space of a nuclear power plant, predicts the human hazards that might result, and devises ways to avoid them. Theoretically there are three types of potential accidents:

1. Accidental criticality and release of radioactivity in populated areas due to transportation mishaps before launch or badly aimed or malfunctioning rocket-launch vehicles.
2. The accidental widespread dispersal of large quantities of radioactivity during the reentry into the atmosphere and consumption by air friction (ablation) of a nuclear power plant.
3. Accidental exposure of persons to whole reactors or pieces of reactors that have been only partly burned up during reentry after power operation in space.

The fact that large rocket-launch vehicles theoretically may fall on any spot on earth forces nuclear-power-plant designers to take special pains to ensure built-in safety, regardless of any accidents that might befall the space system. Several practical arrangements are made to meet these theoretical possibilities. Accidents during the transportation of the nuclear reactor to the launch pad will not endanger anyone because the nuclear fuel is shipped either in several small packages that cannot be made critical or in a reactor that has so much neutron-absorbing material placed in and around its core that no accident can create criticality.

Once the reactor is on the launch pad, attention shifts to the launch trajectory. A rocket failure could "abort" the mission and could cause the reactor, which still would be subcritical, to strike the earth anywhere along the 5000-mile launch range from Cape Kennedy, Florida to Ascension Island, far out in the South Atlantic, assuming the launch was made on the Eastern Test Range. Accidental impact of the nonradioactive reactor on one of the scattered unpopulous islands along the range is unlikely, but, if it did occur, the reactor would just break up like any other piece of equipment. Since the reactor would not have been operated, the unused uranium fuel would not be dangerous.

Suppose, though, that the launch veh
orbital velocity and plunges back in
speeds up to 8000 meters/sec (nearly
between the unprotected reactor and
generate enough heat to burn up some
its still-inert uranium fuel. There
in this case.

Only after the spacecraft is confirm
be given to rotate the neutron refle
control to start a chain reaction in
words, only in orbit would a SNAP re

As a nuclear core generates heat dur
lifetime, the concentration of unstab
products keeps increasing. These fis
enough in a long-lived orbit, but eng
remote chance that a satellite, bear
might reenter the atmosphere earlier
mathematical analysis and experimenta
reactors reentering high above the At
learned how to promote burnup by abla
Ablation would disperse the accumulat
lessly above 100,000 feet. Any radio
ground weeks, months, and even years
safe concentrations by high-altitude
much weaker because of radioactive de

Nuclear safety in space operations is
exhaustive search for things that mig
consequences of the accident are comp
test. Finally, if the consequences w
design is altered, or countermeasures
danger to negligible proportions.

Assessment of Comprehe

1. The main concern of this passage i

   1. the safety factors involved in
      vehicle
   2. malfunctioning rocket-launch v
   3. nuclear reactors
   4. nuclear hazards in space

fety is separate and distinct
Nuclear-safety analysis antici-
t occur during transportation,
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t-launch vehicles theoretically
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Since the reactor would not
used uranium fuel would not be

Suppose, though, that the launch vehicle fails just short of orbital velocity and plunges back into the earth's atmosphere at speeds up to 8000 meters/sec (nearly 5 miles/sec). The friction between the unprotected reactor and the atmosphere would generate enough heat to burn up some or all of the reactor with its still-inert uranium fuel. There would be no nuclear hazard in this case.

Only after the spacecraft is confirmed in orbit will the order be given to rotate the neutron reflectors by remote (radio) control to start a chain reaction in the reactor. In other words, only in orbit would a SNAP reactor be operating.

As a nuclear core generates heat during its normal operating lifetime, the concentration of unstable, radioactive fission products keeps increasing. These fission products are safe enough in a long-lived orbit, but engineers cannot overlook the remote chance that a satellite, bearing a cargo of radioactivity, might reenter the atmosphere earlier than expected. Using mathematical analysis and experimental tests with simulated reactors reentering high above the Atlantic Ocean, engineers have learned how to promote burnup by ablation during reentry. Ablation would disperse the accumulated fission products harmlessly above 100,000 feet. Any radioactivity reaching the ground weeks, months, and even years later would be diluted to safe concentrations by high-altitude winds and would also be much weaker because of radioactive decay in the intervening time.

Nuclear safety in space operations is ensured first by an exhaustive search for things that might go wrong. Then the consequences of the accident are computed or determined by actual test. Finally, if the consequences warrant, the power-plant design is altered, or countermeasures are taken to reduce the danger to negligible proportions.

Assessment of Comprehension

1. The main concern of this passage is

    1. the safety factors involved in a nuclear powered space vehicle
    2. malfunctioning rocket-launch vehicles
    3. nuclear reactors
    4. nuclear hazards in space

2. The chain reaction would not be started in the SNAP reactor aboard a space vehicle until

   1. the reactor reaches the launch pad
   2. a preorbital abort is accomplished
   3. the vehicle undergoes ablation
   4. the spacecraft achieves orbit

3. Neutron reflectors in a SNAP reactor are used to start

   1. orbital velocities
   2. a chain reaction
   3. friction
   4. a launch

4. A space vehicle traveling through the earth's atmosphere at 5 miles per second generates

   1. nuclear fuel
   2. a nuclear reaction
   3. heat
   4. decay

5. A satellite bearing radioactive material that burns up in the atmosphere above 100,000 feet will not be hazardous to people on earth because the radioactivity is reduced by

   1. dilution and decay
   2. dilution and wind
   3. decay and the Atlantic Ocean
   4. remote control

6. Nuclear fuel is prevented from becoming critical by using

   1. small amounts or using neutron reflectors
   2. large amounts or using neutron-absorbing material
   3. small amounts or using neutron-absorbing material
   4. large amounts or using neutron reflectors

Much of historical geology is based on a relationship called the law of superposition. This simply means that when some rock formation was placed on top of some other formation by natural processes (sedimentation or volcanic eruption, for example), the layer on top must be younger than the one on the bottom. Such a conclusion may now seem obvious, but the concept was not even expressed until the very end of the eighteenth century and was still a matter of scientific controversy when Abraham Lincoln was a boy. It was the law of superposition, however, that led the early geologists to establish the first geologic time scales and to realize the enormous extent of geologic time.

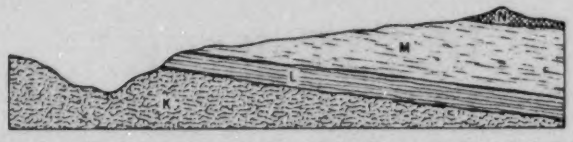

Diagram illustrating the law of superposition. Each rock bed is younger than the strata under it.

In essence the system of establishing age by this concept is this: Somewhere a large and easily recognized layer of sedimentary rock was known. It has a characteristic color, texture, gross composition, and overall appearance. Let us call it *bed M*. This bed could be traced across the countryside until a place was reached where it could be seen that *bed M* rested on another, different layer of rock, which we might call *bed L*. *Bed L* could also be traced some distance and ultimately could be observed resting on a still different stratum, which we shall call *bed K*. Some of these beds had fossils in them, and it was eventually realized that rocks with the same kinds of fossils are of the same age, even though they may differ in other respects—in color or composition, for instance.

If *bed M* was followed in another direction, perhaps a point was reached where it dipped down a little, and here, was found still another layer—call it *bed N*—on top of *M*. Obviously, the sequence of beds from oldest to youngest was *K-L-M-N*. Their relative ages were now established. Over the years, hundreds of geologists described various rock layers and identified the fossils in them. By the middle of the nineteenth century, this "lay
sedimentary rocks was well-known in
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of Antarctica than anyone a hundred
geology of the United States.)

A system of nomenclature for the "la
refined. Gradually this nomenclatur
Long-range correlations between beds
halfway around the globe from each o
the science of *paleontology* develope
almost any rock containing even poor
be determined anywhere in the world
the age of rock layers in relation t
But the real age—the absolute age—
knowledge of radioactivity provided

One of the most talked-about age meas
was the determination of the unexpec
ancestors of man, found by the Briti
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made by Garniss H. Curtis and Jack F
of California in Berkeley by the pot
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old as it "should be" in the view of
remains of such great antiquity had
much doubt was raised about the vali

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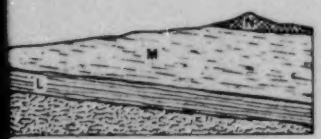

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of the nineteenth century, this "layer-cake" structure of sedimentary rocks was well-known in western Europe. (One may say, parenthetically, that America was geologically a vast unknown at that time. Today we know much more about the geology of Antarctica than anyone a hundred years ago knew about the geology of the United States.)

A system of nomenclature for the "layer-cake" was developed and refined. Gradually this nomenclature was accepted internationally. Long-range correlations between beds of the same age, distant halfway around the globe from each other, were made possible as the science of *paleontology* developed. The relative age of almost any rock containing even poorly preserved fossils could be determined anywhere in the world with precision. That is, the age of rock layers in relation to one another was known. But the real age—the absolute age—remained unknown until knowledge of radioactivity provided the necessary clocks.

One of the most talked-about age measurements in recent years was the determination of the unexpectedly great age of fossil ancestors of man, found by the British anthropologist, Dr. L.S.B. Leakey, in Olduvai Gorge in Tanzania. The measurements were made by Garniss H. Curtis and Jack F. Evernden at the University of California in Berkeley by the potassium-argon method. The age came out a little less than 2 million years, about twice as old as it "should be" in the view of many scientists. Human remains of such great antiquity had never been found before, and much doubt was raised about the validity of the figures.

Time periods as short as two million years are not easy to measure by potassium-argon. The amount of argon produced in that time is extremely small, and contamination by argon from the air is a serious problem. Still, the measurements were repeated, the rocks were studied again, and the result did not change: The fossils were still about 2 million years old.

In cases like this, one tries to find some other method to check the results in an independent way. After many attempts it was discovered that the same rock strata dated by potassium-argon also contained some pumice—a porous volcanic glass—and that this glass was suitable for uranium fission-tract dating. The measurements were made in the General Electric Research Laboratory. What was the result? Just about 2 million years!

When such altogether different techniques give the same number, one can have some confidence that the number is exact. It would be difficult to imagine a disturbance in nature that would cause

these unrelated methods to give the same wrong number—in both cases by a factor of two. The double check simply means the Olduvai man is 2 million years old. There is not much doubt about it.

Assessment of Comprehension

1. The sequence of rock layers K-L-M-N illustrates the

   1. system of nomenclature
   2. law of paleontology
   3. law of superposition
   4. rock layers found only in western Europe

2. Finding the absolute age of rocks depends on the use of

   1. fossils
   2. radioactivity
   3. clocks
   4. Antarctica

3. It was found that rocks, even though they differ in color and composition, are of the same age if they contain

   1. argon
   2. glass
   3. the same kinds of fossils
   4. sediment from beds K, L, M, and N

4. Two methods that depend on the knowledge of radioactivity in determining the age of some rocks are

   1. the sequence of sediments and fossils
   2. fossils and uranium fission-track dating
   3. the sequence of sediments and the potassium-argon method
   4. the potassium-argon method and uranium fission-tract dating

5. Olduvai man was discovered by

   1. Abraham Lincoln
   2. Dr. L.S.B. Leakey
   3. Garniss H. Curtis
   4. Jack F. Evernden

6. Many scientists at first thought t
   Olduvai man was

   1. about 1 million years old
   2. about 2 million years old
   3. found in bed N
   4. a British anthropologist

7. If the fossil of the Olduvai man w
   L in the diagram, then a 100 milli
   would most likely be found in rock

   1. K
   2. L
   3. M
   4. N

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6. Many scientists at first thought that the fossil of the Olduvai man was

   1. about 1 million years old
   2. about 2 million years old
   3. found in bed N
   4. a British anthropologist

7. If the fossil of the Olduvai man was found in rock layer L in the diagram, then a 100 million year old fossil would most likely be found in rock layer

   1. K
   2. L
   3. M
   4. N

The battery has a very close relative, the fuel cell. Unlike the battery the fuel cell has a continuous supply of fuel.

The hydrogen-oxygen cell of Figure 1 is typical of all fuel cells. It essentially burns hydrogen and oxygen to form water. If the hydrogen and oxygen can be supplied continuously and the excess water drained off, we can greatly extend the life of the battery. The fuel cell accomplished this. Fueled *electrical* cell would be more descriptive since the physical principles are identical with those of the battery.

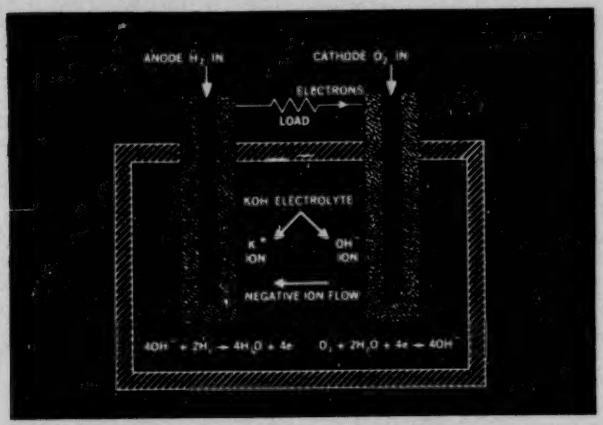

Figure 1 *This diagram shows how a hydrogen–oxygen fuel cell works. The chemical battery works in the same way, except that the chemicals are different and are not continuously supplied from outside the cell. The water produced by the H–O cell shown can be used for drinking on spaceships.*

Perhaps the most challenging task contemplated for the fuel cell is to bring about the consumption of raw or slightly processed coal, gas, and oil fuels with atmospheric oxygen. If fuel cells can be made to use these abundant fuels, then the high natural conversion efficiency of the fuel cells will make them economically superior to the lower efficiency steam-electric plants now in commercial service.

So far we have dwelt on the fuel cell device that is *not* limited by the Car on this theme is possible. Take a hy heat the HI to 2000°K. Some of the H high velocities and dissociate into h $2HI \rightleftharpoons H_2 + I_2$; the higher the tempera dissociation. By separating the hydr returning them for recycling to the f recombined, we have eliminated the fu created a *regenerative* fuel cell. We reintroduced the heat engine and the The thermally regenerative fuel cell a dissociating gas as the working flu

Most of the impetus for developing th device comes from the space program. properties for space missions that ar duration. It is a clean, quiet, vibra Like the battery it has a high electri supplying power peaks and is easily co provide potable water for a crew if th For short missions where large fuel su is also among the lightest power plant

These compelling advantages led the Na Space Administration to choose the fue first manned space ventures. Project landing mission, is the most notable e was not only an energy source, but als cycle which kept the crew alive.

Assessment of Comprehe

1. This passage is concerned with

   1. the National Aeronautics and S
   2. Project Apollo
   3. the hydrogen-oxygen fuel cell
   4. generating electricity in stea

2. This material is supplied to the a

   1. H_2
   2. O_2
   3. KOH
   4. H_2O

se relative, the fuel cell.
l cell has a continuous supply of

f Figure 1 is typical of all fuel
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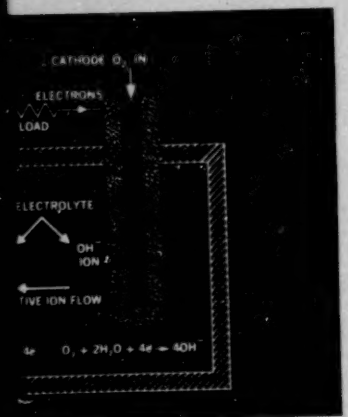

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in commercial service.

So far we have dwelt on the fuel cell as a cold energy conversion device that is *not* limited by the Carnot efficiency. A variation on this theme is possible. Take a hydrogen iodide (HI) cell, and heat the HI to 2000°K. Some of the HI molecules will collide at high velocities and dissociate into hydrogen and iodine: $2HI \rightleftharpoons H_2 + I_2$; the higher the temperature, the more the dissociation. By separating the hydrogen and iodine gases and returning them for recycling to the fuel cell where they are recombined, we have eliminated the fuel supply problem and created a *regenerative* fuel cell. We have, however, also reintroduced the heat engine and the Carnot cycle efficiency. The thermally regenerative fuel cell is a true heat engine using a dissociating gas as the working fluid.

Most of the impetus for developing the fuel cell as a practical device comes from the space program. The cell has admirable properties for space missions that are less than a few months in duration. It is a clean, quiet, vibrationless source of energy. Like the battery it has a high electrical overload capacity for supplying power peaks and is easily controlled. It can even provide potable water for a crew if the Bacon H-O cell is used. For short missions where large fuel supplies are not needed, it is also among the lightest power plants available.

These compelling advantages led the National Aeronautics and Space Administration to choose the fuel cell for some of the first manned space ventures. Project Apollo, the manned lunar landing mission, is the most notable example. Here the fuel cell was not only an energy source, but also part of the ecological cycle which kept the crew alive.

Assessment of Comprehension

1. This passage is concerned with

    1. the National Aeronautics and Space Administration
    2. Project Apollo
    3. the hydrogen-oxygen fuel cell
    4. generating electricity in steam-electric plants

2. This material is supplied to the anode:

    1. H_2
    2. O_2
    3. KOH
    4. H_2O

3. The reaction taking place at the cathode produces

   1. $2H_2O$
   2. 4e
   3. $4OH^-$
   4. $2H_2$

4. This reaction takes place in a thermally regenerative fuel cell:

   1. $4OH^- + 2H_2 \rightarrow 4H_2O + 4e$
   2. $2HI \rightleftarrows H_2 + I_2$
   3. $O_2 + 2H_2O + 4e \rightarrow 4OH^-$
   4. $HI \rightleftarrows 2000°K$

5. A battery and a fuel cell are similar in that both produce

   1. anodes
   2. cathodes
   3. iodine
   4. electricity

6. A fueled electrical cell receives a continuous supply of

   1. electrolyte
   2. ions
   3. water
   4. hydrogen and oxygen

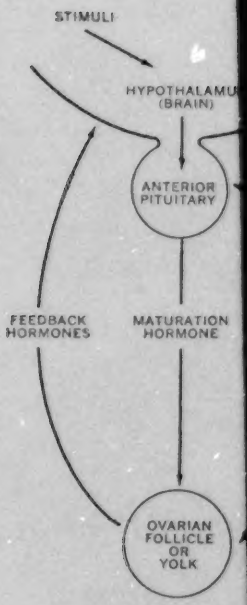
7. The fuel cells aboard the Apollo lunar mission provided the crew with

   1. bacon
   2. oxygen
   3. water
   4. iodine

Some of the earliest studies of ovulation in domestic hens led to the conclusion that light is probably the main external stimulus to egg production. Since the hen's eye picks up the light and sends signals to the brain, it was reasoned that the brain must be the initial biological clock involved in ovulation. It was also discovered that the anterior pituitary gland, located directly beneath the brain, is the organ responsible for secretion of the hormones which are necessary for ovulation. The portion of the brain known as the hypothalamus apparently is directly responsible for the initial internal stimulation.

There is considerable evidence that upon receipt of a light-controlled signal, nerve terminals of the hypothalamus discharge a substance called releasing factor into the bloodstream. This is carried to the pituitary where it stimulates that gland into secreting the maturation and ovulation hormones. These hormones travel to the ovary where the ovulation, or luteinizing, hormone (LH) causes rupture of the saclike membrane which surrounds the single, fully developed yolk. This permits the yolk to be released from the ovary. The infundibulum, or upper end of the oviduct, then engulfs this free yolk and starts it on its journey down the hen's reproductive tract.

Besides causing maturation and ovulation of a yolk, the pituitary-secreted hormones cause the ovary to secrete hormones of its own. These are thought to be estrogens and progestagens and are called feedback hormones. When they reach the hypothalamus, they cause a signal to go to the pituitary which inhibits its hormone production, completing the cycle. (See Figure 1)



Hormone secretion and flo
ovulation process. When bra
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gland to release maturation a
hormones. After maturation
of an ova, the ovary secrete
hormones which tell brain it
pituitary to reduce its hormo
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Figure 1

Assessment of Comprehe

1. The organization of this passage is bas

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   2. ovulation
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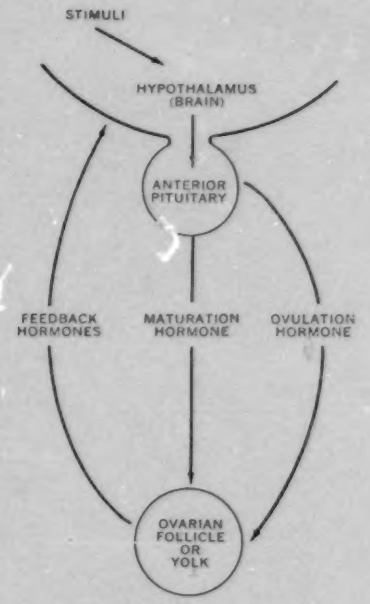

Hormone secretion and flow in hen's ovulation process. When brain is stimulated by light, it signals anterior pituitary gland to release maturation and ovulation hormones. After maturation and release of an ova, the ovary secretes feedback hormones which tell brain it is time for pituitary to reduce its hormone production, thus completing ovulation cycle.

Figure 1

Assessment of Comprehension

1. The organization of this passage is based on

   1. hormones
   2. ovulation
   3. the sequence of events in the reproductive cycle in hens
   4. the nature of external stimuli causing egg production

2. The initial biological clock involved in ovulation is the

   1. light
   2. eye
   3. brain
   4. pituitary gland

3. The correct sequence of parts involved in the ovulation cycle is

   1. hypothalamus-pituitary-ovary-hypothalamus
   2. pituitary-hypothalamus-ovary-pituitary
   3. ovary-hypothalamus-ovary-pituitary
   4. hypothalamus-ovary-pituitary-ovary

4. Estrogens and progestagens are secreted by the

   1. hypothalamus
   2. pituitary
   3. oviduct
   4. ovary

5. The infundibulum is part of the

   1. pituitary
   2. ovary
   3. oviduct
   4. yolk

6. The release of the yolk from the ovary is stimulated by

   1. the infundibulum
   2. luteinizing hormone
   3. estrogen
   4. progestagen

7. The hypothalamus is part of the

   1. brain
   2. pituitary gland
   3. oviduct
   4. ovary

8. Light and feedback hormones cause this structure to be stimulated:

   1. ovary
   2. pituitary
   3. oviduct
   4. hypothalamus

Many crops and plants grow best only if the soil reaction is suitable. Adjustment of soil acidity to the proper level often is important in good management.

Liming to reduce soil acidity is an extensive and routine practice in most of the eastern half of the United States. Soil acidity develops gradually in humid regions as the calcium and magnesium are slowly lost from the soil by leaching and is speeded by crop removals and by use of the soil.

Benefits from liming result from more than mere reduction of soil acidity. Two major plant nutrients, calcium and magnesium, are supplied by liming materials. Soils that have too little calcium and magnesium for best plant growth often are highly acid. Liming may supply calcium and magnesium and correct the soil acidity at the same time. Calcium and magnesium are removed in crops in large amounts, and those removals, along with leaching, contribute to the gradual development of acidity, a normal soil process in humid areas.

Liming influences the solubility of many compounds in the soil. Large amounts of iron, aluminum, and manganese may come into solution in a strongly acid soil and may be adsorbed on the surface of the soil particle in a form that plants can easily take up. Sometimes high levels of easily soluble manganese and aluminum are believed to be toxic to crops—a condition that liming can correct.

Liming influences the form of phosphorus in the soil. Phosphates are believed to react in highly acid soils with the active iron and aluminum to form complex substances. Calcium is the dominant ion on the surface of the soil particle in properly limed soils, and the phosphates apparently can be utilized more readily. In alkaline soils, phosphates react with the surface of calcium carbonate particles and crops utilize them less readily.

Myriad bacteria, fungi, and other kinds of micro-organisms abound in fertile soils. Some of the organisms are active in the decay of crop residues and manures in the soil. Decay processes release some of the nitrogen, phosphorus, and other mineral nutrients from these residues for subsequent crops. The activity of the micro-organisms and consequently the phosphorus and nitrogen fertility generally increase when an acid soil is limed.

The acidity in most soils is on the
An acid (sour) soil should not be th
soil particles in a solution of dilu
almost completely to the surface of

This ability to hold cations on the
chiefly in the clay, fine silt, and
particles have little ability to hol
form.

The exchange capacity of a soil unde
occupied with ions of hydrogen (acid
potassium, and sometimes sodium. If
exchange capacity is occupied by hyd
liming is needed. Liming will be unn
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magnesium.

This exchange capacity of many soils
filled with acid ions. Such soils ar
materials furnish calcium and magnesi
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In a well-limed agricultural soil, ab
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magnesium; there are about 5 to 10 ti
magnesium ions. Potassium may be exp
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To assist in determining needs for li
testing laboratories are operated in
agricultural experiment stations and
testing services also are available f
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The acidity in most soils is on the surface of the soil particles. An acid (sour) soil should not be thought of as a mixture of inert soil particles in a solution of dilute acid. The acid ions stick almost completely to the surface of the soil particles.

This ability to hold cations on the particle surfaces resides chiefly in the clay, fine silt, and organic matter. Coarser particles have little ability to hold cations in this exchangeable form.

The exchange capacity of a soil under natural conditions is occupied with ions of hydrogen (acid), calcium, magnesium, potassium, and sometimes sodium. If a large proportion of the exchange capacity is occupied by hydrogen, the soil is acid and liming is needed. Liming will be unnecessary if a high proportion of the exchange capacity is occupied by calcium and magnesium.

This exchange capacity of many soils in nature is more than half-filled with acid ions. Such soils are extremely acid. Liming materials furnish calcium and magnesium to replace and neutralize the acidity.

In a well-limed agricultural soil, about 80 to 90 percent of the exchange capacity is ordinarily occupied with calcium plus magnesium; there are about 5 to 10 times as many calcium ions as magnesium ions. Potassium may be expected to occupy 2 to 5 percent of the capacity, and hydrogen (acid) the rest. Critical values for the balance among these ions have not been set, although normal ranges are well established.

To assist in determining needs for lime and fertilizers, soil-testing laboratories are operated in every State through the agricultural experiment stations and extension service. Soil-testing services also are available from many private companies and consulting services. Tests to indicate the lime needs of farm soils and recommendations for method and time of application are made.

Assessment of Comprehension

1. A soil that does not have an acid condition is

   1. a leached soil
   2. an alkaline soil
   3. a sour soil
   4. a cation soil

2. Ions of hydrogen, calcium, potassium and other positive ions are called

   1. cations
   2. anions
   3. acids
   4. alkalies

3. Liming a soil generally reduces its

   1. magnesium content
   2. calcium content
   3. alkalinity
   4. acidity

4. Decay of organic matter in the soil is caused by

   1. lime
   2. acid
   3. iron
   4. bacteria

5. In a good agricultural soil 80 to 90 percent of the exchange capacity is occupied with

   1. hydrogen and potassium
   2. potassium and magnesium
   3. magnesium and calcium
   4. calcium and hydrogen

6. The uptake of phosphates can take place readily if the dominant ion on the surface of soil particles is

   1. hydrogen
   2. cation
   3. calcium
   4. potassium

7. Minerals are lost from the soil by

   1. fertilizing
   2. decaying
   3. liming
   4. leaching

8. Liming is needed when the exchange taken up with a large proportion o

   1. calcium
   2. hydrogen
   3. magnesium
   4. bacteria

t of Comprehension

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   1. fertilizing
   2. decaying
   3. liming
   4. leaching

8. Liming is needed when the exchange capacity of a soil is taken up with a large proportion of

   1. calcium
   2. hydrogen
   3. magnesium
   4. bacteria

Energy enters the biosphere in the form of radiation from the sun. Photosynthesis changes this energy into chemical form and from the organic materials thus produced the energy for all the activities of plants and animals is derived. The amount of radiation received by any specific part of the earth's surface is, therefore, a most important environmental factor for organisms. The way in which solar radiation is received has very great consequences for other aspects of the environment.

Solar radiation is received unequally at different places on the earth's surface. The shape of the earth is one cause of this unequal distribution of solar energy. Figure 1 shows the two ways in which this factor operates.

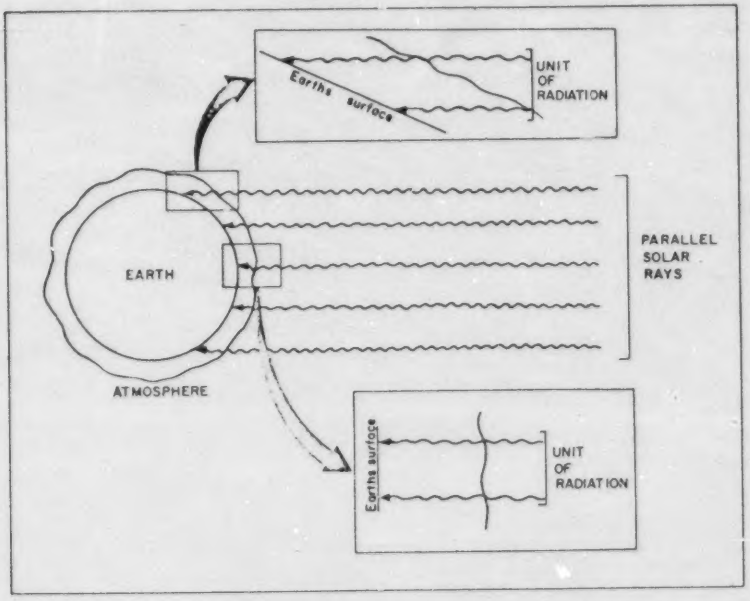

Figure 1 Effect of solar elevation on radiation received.

First, some solar energy is lost in t
must traverse the atmosphere in order
face. The greater the thickness of a
the more energy absorbed. Rays which
through less atmosphere than those wh
atmosphere at an angle less than 90°.
earth on which the light falls at an
more energy than other parts.

Second, there is the "stretch-out" of
the earth's surface at an acute angle.
Figure 1.) A flashlight shows this we
circle results when a piece of paper
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oval is observed. The light is dimmer
a greater area. Therefore, in general
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and decreases rapidly toward the poles

Consideration of the time of year is n
radiation is not always received direc
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December 21 the vertical rays of the s
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the horizon. Thus the most solar radia
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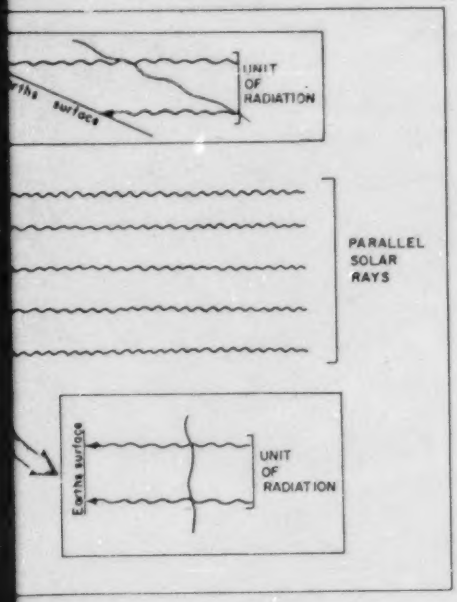

elevation on radiation received.

First, some solar energy is lost in the atmosphere. Solar energy must traverse the atmosphere in order to reach the earth's surface. The greater the thickness of atmospheric blanket traversed, the more energy absorbed. Rays which travel straight down travel through less atmosphere than those which travel through the atmosphere at an angle less than 90°. Hence, the parts of the earth on which the light falls at an angle near 90° will receive more energy than other parts.

Second, there is the "stretch-out" of solar energy which strikes the earth's surface at an acute angle. (See the insets of Figure 1.) A flashlight shows this well. A brightly lighted circle results when a piece of paper is held at 90° to the beam of light. When the paper is held at a slant, a dimmer, elongated oval is observed. The light is dimmer because it is spread over a greater area. Therefore, in general, the solar radiation received by the earth's surface is greatest around the middle and decreases rapidly toward the poles.

Consideration of the time of year is necessary, for the maximum radiation is not always received directly at the equator. As the earth revolves around the sun, the tilt of the earth's axis causes a shift in the latitude at which rays fall vertically. On December 21 the vertical rays of the sun will fall 23 1/2° south of the equator (Tropic of Capricorn) and on June 21, 23 1/2° north (Tropic of Cancer). The sun is never vertical beyond these latitudes, and at the poles it is never more than 23 1/2° above the horizon. Thus the most solar radiation is received between the two tropics, the least at the poles. (See Figure 2.)

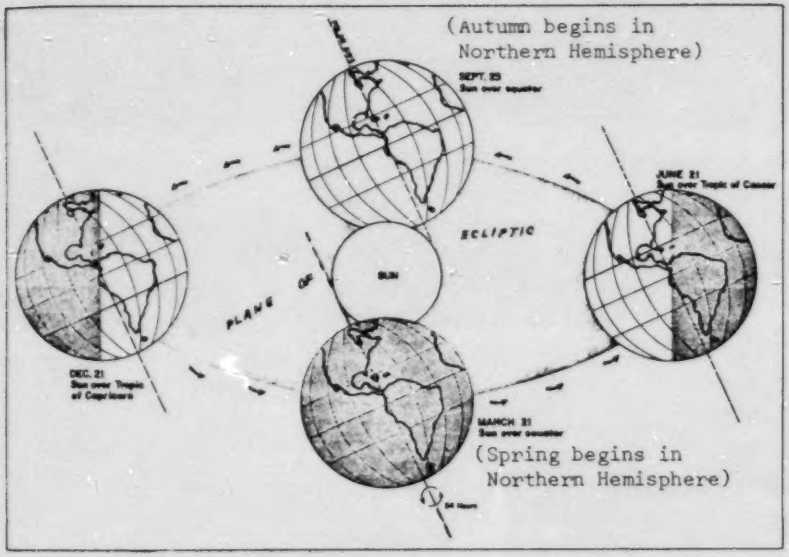

Figure 2 Relation between earth and sun during annual cycle.

Another consequence of the tilt of the earth is shown in Figure 3. There is always 12 hours of daylight at the equator, and day length never varies greatly within the tropics. At the poles, however, the sun shines for six months at a stretch.

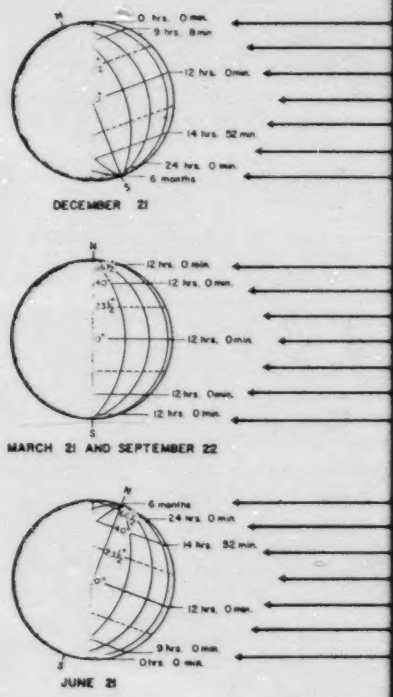

Figure 3 Distribution of daily radiatio

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vary according to geographical position
time of year, with corresponding effect
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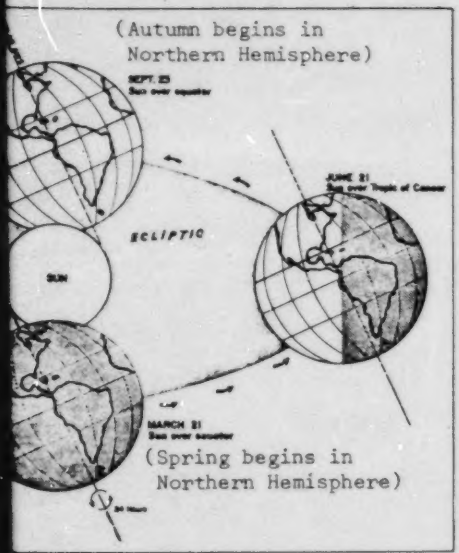

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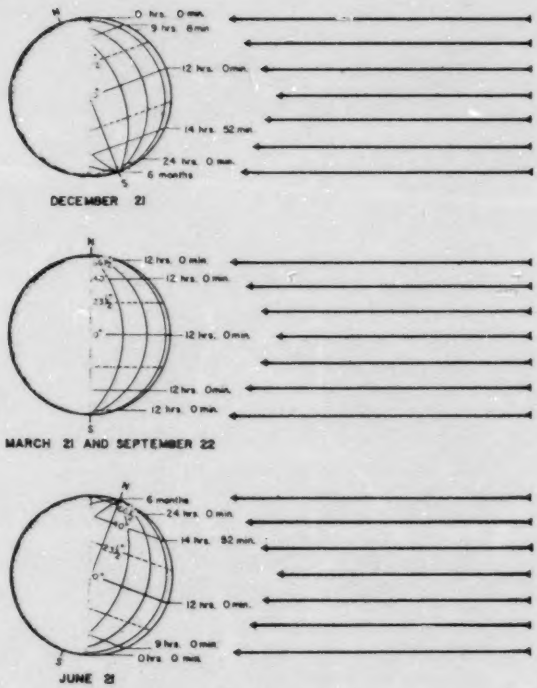

Figure 3 Distribution of daily radiation in the annual cycle.

There is great variation both in the rhythm of solar radiation and in its intensity over the earth's surface. Therefore the rate of photosynthesis over the surface of the earth will vary according to geographical position and according to time of year, with corresponding effects on the whole biotic community.

Assessment of Comprehension

1. The ultimate source of energy for living things is

   1. organic material
   2. chemical energy
   3. radiation from the sun
   4. photosynthesis

2. The amount of solar energy received by a certain area on the earth's surface will influence the

   1. rate of photosynthesis
   2. the angle of the sun's rays
   3. tilt of the earth's axis
   4. seasons

3. The two causes of unequal distribution of solar energy shown in Figure 1 are the

   1. tilt of the earth's axis and season of the year
   2. tilt of the earth's axis and the number of hours of daylight
   3. thickness of the atmosphere and the angle at which the light strikes the earth's surface
   4. shape of the earth and the tilt of the earth's axis

4. In New York State, autumn begins on

   1. March 21
   2. June 21
   3. September 23
   4. December 21

5. In Figure 2, the earth is shown revolving around the sun

   1. in a clockwise direction
   2. in a counterclockwise direction
   3. once every 24 hours
   4. with the same part of the earth always facing the sun

6. The sun is never vertical beyond a

   1. 0°
   2. 23 1/2°
   3. 40°
   4. 90°

7. In Figure 3, the north pole receiv

   1. March 21
   2. June 21
   3. September 22
   4. December 21

8. On December 21st the vertical rays earth in the southern hemisphere a This latitude is named the

   1. south pole
   2. equator
   3. Tropic of Cancer
   4. Tropic of Capricorn

9. The vertical rays of the sun do no the earth at the same position thr of the

   1. tilt of the earth's axis
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   3. "stretch-out" effect of the lu
   4. fact that the equator receives every day

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6. The sun is never vertical beyond a latitude of

   1. 0°
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   1. March 21
   2. June 21
   3. September 22
   4. December 21

8. On December 21st the vertical rays of the sun will reach the earth in the southern hemisphere at a latitude of 23 1/2°. This latitude is named the

   1. south pole
   2. equator
   3. Tropic of Cancer
   4. Tropic of Capricorn

9. The vertical rays of the sun do not strike the surface of the earth at the same position throughout the year because of the

   1. tilt of the earth's axis
   2. thickness of the earth's atmosphere
   3. "stretch-out" effect of the lunar energy
   4. fact that the equator receives 12 hours of radiation every day

The big "selling" point of the nuclear rocket is its higher exhaust velocity, which is approximately double that of the best chemical rockets. Since the doubled exhaust velocity means that the nuclear rocket uses only half as much propellant each second of operation, the nuclear rocket can *do* much more than a chemical rocket with equal thrust.

The nuclear rocket's great economy in prope lant consumption tends to make it superior for missions in which most of the spacecraft weight is allotted to propellant. This is subject to the condition that the payload is not a great deal smaller than the weight of the nuclear engine itself. To illustrate, a nuclear rocket would make a poor launch vehicle for placing a 1-ton Observatory Class scientific satellite into orbit; the advantage of halved propellant consumption would be negated by the unavoidable orbiting of 15 tons of engine weight. Neither would a nuclear rocket be the best engine for a mission where only small velocity changes are desired, such as for the moderate maneuvering of an orbiting laboratory. But manned expeditions to Mars, or the ferrying of supplies to the moon, are right down the nuclear rocket's alley. Generally speaking, the more "ambitious" the mission, the better the nuclear rocket looks.

The role of the nuclear rocket is not in journeys beginning at the launch pad, for which chemical engines have been so successful, but rather in outer space where the nuclear rocket's high exhaust velocity is a great asset. Nuclear rockets should be thought of as prime movers for missions beginning *from an earth orbit* and moving outward toward the moon and planets. Therefore, very high-thrust levels are not desired for nuclear rockets because they are not required to lift off a launch pad.

The nuclear rocket should prove superior to the now-dominant chemical rocket during the manned Mars landing projected for the 1980's. The concept is for a nuclear-propelled vehicle that would be assembled in earth orbit. The payload leaving earth orbit for Mars would be about 500,000 kg and would be able to support six to eight men during the 450-day roundtrip. Propelling this payload to Mars and a portion of it back to earth would require the orbiting and assembling of 1,000,000 kg of materials in an earth orbit by multiple launches of chemical rockets from the earth's surface. Large as this figure is, it is less than half that needed by a chemical rocket. (See Figure 1.)

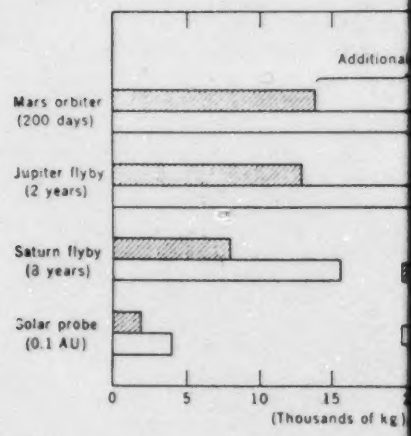

Figure 1

Graph shows additional payloads possible on fo
sions with nuclear rockets used as third stages
compared with chemical rocket third stages.

There are other "ambitious" space miss
Propulsion Modules seem demonstrably s
—Manned flyby missions to Mars and
—Solar probes that penetrate close
—Heavy, unmanned planetary probes
other major planets
—Direct flights to the moon that w
difficulties involved in a luna
—Lunar ferry missions, where the n
Module could propel large paylo
orbit and lunar orbit

Despite the superiority indicated in t
the real value of the nuclear rocket l
is a true advance in overall propulsio
it is not as big a jump as the automob
horse, but it is at least like the adv
over propeller-driven planes.

nuclear rocket is its higher
oximately double that of the
he doubled exhaust velocity
ses only half as much propellant
uclear rocket can *do* much more
al thrust.

omy in propellant consumption
issions in which most of the
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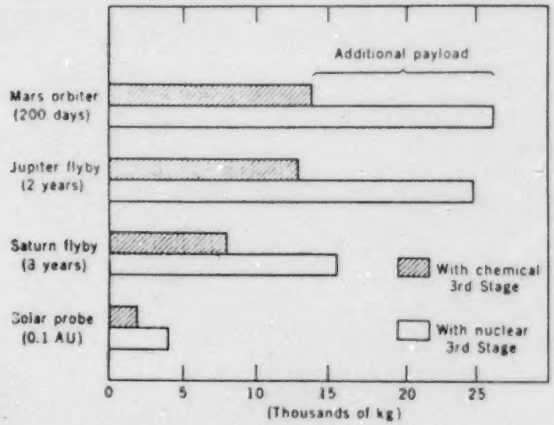

Figure 1

Graph shows additional payloads possible on four deep space missions with nuclear rockets used as third stages on space vehicles, compared with chemical rocket third stages.

There are other "ambitious" space missions where nuclear Propulsion Modules seem demonstrably superior. They include:

- —Manned flyby missions to Mars and Venus
- —Solar probes that penetrate close to the sun
- —Heavy, unmanned planetary probes to Jupiter and the other major planets
- —Direct flights to the moon that would eliminate the difficulties involved in a lunar orbit rendezvous
- —Lunar ferry missions, where the nuclear Propulsion Module could propel large payloads between earth orbit and lunar orbit

Despite the superiority indicated in these particular missions, the real value of the nuclear rocket lies in the fact that it is a true advance in overall propulsion capability; perhaps it is not as big a jump as the automobile was over the horse, but it is at least like the advance of jet aircraft over propeller-driven planes.

Assessment of Comprehension

1. Figure 1 shows that by using a nuclear third stage on any of the missions, the payload can be

   1. nearly halved
   2. nearly doubled
   3. sent into space at double the velocity
   4. returned from space in half the time

2. The advantage of nuclear rockets over chemical rockets is their

   1. added weight
   2. higher exhaust velocity
   3. use as launch vehicles
   4. use in maneuvering orbiting laboratories

3. A nuclear engine weighs about

   1. 1 ton
   2. 15 tons
   3. 500,000 kg
   4. 1,000,000 kg

4. Direct flights to the moon would eliminate the need for

   1. a crew
   2. chemical rockets
   3. missions to Mars
   4. rendezvous in lunar orbit

5. Nuclear rockets would be used to

   1. propel space ships from earth
   2. propel space ships from earth orbit
   3. launch small scientific satellites
   4. maneuver orbiting laboratories

6. The total payload of a Jupiter mission using a nuclear third stage rocket is about

   1. 4 thousand kg
   2. 13 thousand kg
   3. 15 thousand kg
   4. 25 thousand kg

7. The two missions that would carry the

   1. Mars orbiter and the Saturn fl
   2. Jupiter flyby and the Saturn
   3. Mars orbiter and the Jupiter
   4. Solar probe and the Saturn fl

ment of Comprehension

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is about

7. The two missions that would carry about the same payload are the

   1. Mars orbiter and the Saturn flyby
   2. Jupiter flyby and the Saturn flyby
   3. Mars orbiter and the Jupiter flyby
   4. Solar probe and the Saturn flyby

The uncanny ability of activation analysis to detect and identify very tiny amounts of certain elements has come to the aid of law-enforcement officers in a variety of ways.

Human hair, for example, contains small traces of metallic elements like sodium, gold, and copper. Activation analysis has shown that the quantities of these elements present in each hair are relatively constant for an individual but vary from person to person.

The fact that a person died from poisoning can sometimes be determined through activation analysis. Even nonlethal doses of arsenic, for example, produce arsenic-rich regions in the subject's hair that gradually move from root to tip as the hair grows. Hair even hundreds of years old can be analyzed successfully for arsenic and other residues.

English scientists recently found an unusual amount of arsenic in a relic of hair from Napoleon's head. The suspicion now is that he was slowly poisoned to death.

The case of King Eric XIV of Sweden is similar. A murder legend has persisted in Sweden for four centuries. When the king's body was exhumed recently, activation analysis showed that his body contained traces of poisonous arsenic.

Activation analysis goes beyond these ghoulish activities in helping to solve crimes. Besides being able to match human hair, it can also compare infinitesimal grease spots, specks of dirt too small to be seen with the naked eye, and tiny flakes of paint from automobiles in accidents. It can do this in either of two ways. It can either match bits of material left behind at the scene of a crime to a suspect, or it can identify minute traces of substances that he has carried away from the scene. What's more, identification can be made without damaging the specimens. Thus, they can later be admitted as evidence in court.

Investigations show that activation analysis of wipings taken from a suspect's hands will reveal not only whether he has fired a gun recently but also the type of ammunition used, the number of bullets fired, and the hand in which the gun was held. This is possible because when a gun is discharged gunpowder residues spread over a wide area, including the holder of the gun. These residues contain small amounts of various metals that can be measured easily by activation analysis.

The incredible sensitivity of activatio
gunpowder traces is evident in the foll
after a test during which a subject fir
different types of ammunition:

SAMPLE	ELEMENTS FOUND IN WIPING (MICROGRAMS	
	Antimony	Barium
Left hand	0.03	0.20
Right hand	0.09	0.30
Left hand	0.11	0.29
Right hand	0.20	0.35

It can be seen that, while the relative
the gunpowder varied from one brand of
other, the subject quite obviously used
in each firing.

Assessment of Compr

1. The element that was found in the g
gunpowder residues was

   1. arsenic
   2. antimony
   3. barium
   4. copper

2. When using ammunition manufactured
difference in the amount of barium

   1. 0.1 microgram
   2. 0.2 microgram
   3. 0.3 microgram
   4. 0.5 microgram

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The incredible sensitivity of activation analysis in detecting gunpowder traces is evident in the following data taken after a test during which a subject fired a gun twice, using different types of ammunition:

SAMPLE	ELEMENTS FOUND IN HAND WIPING (MICROGRAMS)			TYPE OF AMMUNITION
	Antimony	Barium	Copper	
Left hand	0.03	0.20	1.73	Peters
Right hand	0.09	0.30	3.80	
Left hand	0.11	0.29	1.94	Western
Right hand	0.20	0.35	7.20	

It can be seen that, while the relative amounts of metals in the gunpowder varied from one brand of ammunition to the other, the subject quite obviously used his right hand in each firing.

Assessment of Comprehension

1. The element that was found in the greatest amount in gunpowder residues was

   1. arsenic
   2. antimony
   3. barium
   4. copper

2. When using ammunition manufactured by Peters, the difference in the amount of barium found on both hands was

   1. 0.1 microgram
   2. 0.2 microgram
   3. 0.3 microgram
   4. 0.5 microgram

3. Napoleon and King Eric XIV of Sweden both could have been

   1. poisoned
   2. bald
   3. involved in auto accidents
   4. shot with Peters or Western ammunition

4. As seen from the table, greater amounts of all elements on the person's right hand indicate that the

   1. person firing the gun was right handed
   2. person firing the gun was left handed
   3. gun was fired with the right hand
   4. gun was fired with the left hand

5. The amount of copper, measured in micrograms, found on the person's right hand after using Western ammunition was

   1. 1.73
   2. 1.94
   3. 3.80
   4. 7.20

6. More of this element was found on the person's left hand when using Western ammunition than on the person's gun hand when using Peters ammunition:

   1. arsenic
   2. antimony
   3. barium
   4. copper

7. An advantage of activation analysis in legal cases is that

   1. all people have arsenic in their hair
   2. gunpowder residue is the same from all ammunition
   3. the specimens are not damaged
   4. it only can be used with specks too small to be seen with the naked eye

If you vigorously knead a lemon to free the juices and then stick a strip of zinc in one end and a copper strip in the other, you can measure a voltage across the strips. Electrons will flow through the load without the inconvenience of having to supply heat. You have made yourself a chemical battery.

The chemical battery was the first direct conversion device. Two hundred years ago it was the scientists' only continuous source of electricity.

Since the chemical battery does not need heat for its operation, it is logical to ask what makes the current flow. Where does the energy come from?

The battery has no semiconductors, but, like the thermoelectric couple and the thermionic diode, it uses dissimilar materials for its electrodes. A conducting fluid or solid is also present to provide for the passage of current between the electrodes. In the example of the lemon, the copper and zinc are the dissimilar electrodes, and the lemon juice is the conducting fluid or *electrolyte* that supplies positive and negative ions. The battery derives its energy from its complement of chemical fuel. The voltage difference arises because of the different strengths of the chemical bonds. The chemical bond is basically an electrostatic one; some atoms have stronger electrical affinities than others.

Consider the following chemical reactions of common batteries together with some fuel cell reactions.

Battery Reactions	Fuel Cell Reactions
$Pb + PbO_2 + 2H_2SO_4 \rightleftarrows 2PbSO_4 + 2H_2O$	$2LiH \rightleftarrows 2Li + H_2$
$Fe + NiO_2 \rightleftarrows FeO + NiO$	$2CuBr_2 \rightleftarrows 2CuBr + Br_2$
$Zn + AgO + H_2O \rightleftarrows Ag + Zn(OH)_2$	$2H_2 + O_2 \rightleftarrows 2H_2O$ (Bacon cell)
$Pb + Ag_2O \rightleftarrows PbO + 2Ag$	$PbI_2 \rightleftarrows Pb + I_2$

In principle all these reactions are the same as those going on inside the lemon, although each type of cell produces a slightly different voltage because of the varying chemical affinities of the atoms and molecules involved. There are literally hundreds of materials which can be used for electrolytes and electrodes.

No heat needs to be added as the elect
are broken and remade in a battery to
power. In lead storage batteries, suc
mobiles, the reaction $Pb + PbO_2 + 2H_2S$
produces electricity. The chemical re
ferred to the electrical load with alm
The reactions cannot go on forever, ho
battery supplies the energy converter
supply of fuel. Eventually the fuel i
voltage drops to zero. This deficienc
fuel cell in which fuel is supplied co

Assessment of Comprehens

1. In the lemon battery, the lemon ju

   1. an electrode
   2. an electrolyte
   3. a thermoelectric couple
   4. a thermionic diode

2. The chemical bonds of substances i
   are

   1. thermoelectric
   2. electrostatic
   3. negative
   4. positive

3. This reaction takes place in a fue

   1. $Fe + NiO_2 \rightleftarrows FeO + NiO$
   2. $2LiH \rightleftarrows 2H_2O$
   3. $Pb + Ag_2O \rightleftarrows Pb + I_2$
   4. $2CuBr_2 \rightleftarrows 2CuBr + Br_2$

4. In the following battery reactions
   $2PbSO_4 + 2H_2O$ and $Pb + Ag_2O \rightleftarrows PbO$
   electrode composed of

   1. Pb
   2. PbO_2
   3. PbO
   4. $PbSO_4$

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ode, it uses dissimilar materials
cting fluid or solid is also present
f current between the electrodes.
the copper and zinc are the
he lemon juice is the conducting
upplies positive and negative ions.
rgy from its complement of chemical
e arises because of the different
nds. The chemical bond is
ne; some atoms have stronger
thers.

ical reactions of common batteries
reactions.

Fuel Cell Reactions

$+ 2H_2O$ $2LiH \rightleftharpoons 2Li + H_2$

$2CuBr_2 \rightleftharpoons 2CuBr + Br_2$

$)_2$ $2H_2 + O_2 \rightleftharpoons 2H_2O$ (Bacon cell)

$PbI_2 \rightleftharpoons Pb + I_2$

tions are the same as those going
gh each type of cell produces a
because of the varying chemical
molecules involved. There are
ials which can be used for
.

No heat needs to be added as the electrostatic chemical bonds are broken and remade in a battery to generate electrical power. In lead storage batteries, such as used in automobiles, the reaction $Pb + PbO_2 + 2H_2SO_4 \rightleftharpoons 2PbSO_4 + 2H_2O$ produces electricity. The chemical reaction energy is transferred to the electrical load with almost 100% efficiency. The reactions cannot go on forever, however, because the battery supplies the energy converter with a very limited supply of fuel. Eventually the fuel is consumed and the voltage drops to zero. This deficiency is remedied by the fuel cell in which fuel is supplied continuously.

Assessment of Comprehension

1. In the lemon battery, the lemon juice acts as

   1. an electrode
   2. an electrolyte
   3. a thermoelectric couple
   4. a thermionic diode

2. The chemical bonds of substances in a chemical battery are

   1. thermoelectric
   2. electrostatic
   3. negative
   4. positive

3. This reaction takes place in a fuel cell:

   1. $Fe + NiO_2 \rightleftharpoons FeO + NiO$
   2. $2LiH \rightleftharpoons 2H_2O$
   3. $Pb + Ag_2O \rightleftharpoons Pb + I_2$
   4. $2CuBr_2 \rightleftharpoons 2CuBr + Br_2$

4. In the following battery reactions $Pb + PbO_2 + 2H_2SO_4 \rightleftharpoons 2PbSO_4 + 2H_2O$ and $Pb + Ag_2O \rightleftharpoons PbO + 2Ag$ both have an electrode composed of

   1. Pb
   2. PbO_2
   3. PbO
   4. $PbSO_4$

5. When an automobile battery discharges, the chemical reaction results in the formation of

   1. PbO + 2AG
   2. $Pb + PbO_2 + 2H_2SO_4$
   3. $2PbSO_4 + 2H_2O$
   4. $Pb + Ag_2O$

6. Batteries and fuel cells derive their energy from

   1. electricity
   2. electrolytes
   3. heat
   4. chemical reactions

7. The voltage in a chemical battery drops to zero when

   1. heat is lost
   2. electrostatic chemical reactions occur
   3. dissimilar electrodes are used
   4. the fuel is consumed

8. Water is an end product in

   1. all fuel cell reactions
   2. all battery reactions
   3. both the automobile battery and the Bacon cell
   4. dead batteries

S1	S2	S3	S4	S5
1. (4)	1. (1)	1. (2)	1. (1)	1. (F)
2. (2)	2. (4)	2. (4)	2. (2)	2. (A)
3. (2)	3. (2)	3. (3)	3. (3)	3. (H)
4. (1)		4. (4)	4. (3)	4. (C)
		5. (1)	5. (1)	5. (G)
		6. (2)	6. (4)	6. (B)
		7. (2)	7. (4)	7. (E)
			8. (3)	8. (D)

S9	S10	S11	S12	S13
1. (3)	1. (3)	1. (3)	1. (2)	1. (3)
2. (2)	2. (1)	2. (3)	2. (1)	2. (1)
3. (3)	3. (3)	3. (1)	3. (4)	3. (3)
4. (4)	4. (2)	4. (4)	4. (4)	4. (3)
5. (2)	5. (4)	5. (3)	5. (3)	5. (2)
6. (1)	6. (4)	6. (2)	6. (3)	6. (2)
7. (1)	7. (3)	7. (1)	7. (4)	7. (4)
		8. (4)	8. (2)	8. (4)
				9. (1)

CORRECT RESPONSES TO ASSESSMENTS OF COMPREHENSION

le battery discharges, the chemical
in the formation of

$2H_2SO_4$
0

el cells derive their energy from

ctions

chemical battery drops to zero when

c chemical reactions occur
lectrodes are used
consumed

product in

reactions
reactions
omobile battery and the Bacon cell
es

S1	S2	S3	S4	S5	S6	S7	S8
1. (4)	1. (1)	1. (2)	1. (1)	1. (F)	1. (3)	1. (1)	1. (1)
2. (2)	2. (4)	2. (4)	2. (2)	2. (A)	2. (2)	2. (3)	2. (4)
3. (2)	3. (2)	3. (3)	3. (3)	3. (H)	3. (1)	3. (2)	3. (2)
4. (1)		4. (4)	4. (3)	4. (C)	4. (2)	4. (4)	4. (3)
		5. (1)	5. (1)	5. (G)	5. (4)	5. (1)	5. (1)
		6. (2)	6. (4)	6. (B)	6. (4)	6. (3)	6. (3)
		7. (2)	7. (4)	7. (E)	7. (3)	7. (3)	
			8. (3)	8. (D)		8. (1)	

S9	S10	S11	S12	S13	S14	S15	S16
1. (3)	1. (3)	1. (3)	1. (2)	1. (3)	1. (2)	1. (4)	1. (2)
2. (2)	2. (1)	2. (3)	2. (1)	2. (1)	2. (2)	2. (1)	2. (2)
3. (3)	3. (3)	3. (1)	3. (4)	3. (3)	3. (2)	3. (1)	3. (4)
4. (4)	4. (2)	4. (4)	4. (4)	4. (3)	4. (4)	4. (3)	4. (1)
5. (2)	5. (4)	5. (3)	5. (3)	5. (2)	5. (2)	5. (4)	5. (3)
6. (1)	6. (4)	6. (2)	6. (3)	6. (2)	6. (4)	6. (2)	6. (4)
7. (1)	7. (3)	7. (1)	7. (4)	7. (4)	7. (3)	7. (3)	7. (4)
		8. (4)	8. (2)	8. (4)			8. (3)
				9. (1)			

The selection...	entitled...	begins on page....	and provides reinforcement in....
SS1	Ratifying the Constitution	33	using roots and affixes commonly found in social studies reading material
SS2	Conditional Freedom	33	using context clues
SS3	Labor Force Growth	34	general vocabulary used in a special sense
SS4	President Jackson's Veto	34	specialized vocabulary
SS5	Wilson's Noninvolvement	34	specialized vocabulary
SS6	Conflict on the Canadian Border	35	specialized vocabulary
SS7	The Democracy of Rhode Island	35	specialized vocabulary
SS8	A Political Innovator	35	specialized vocabulary
SS9	The Unwanted War of 1812	35	specialized vocabulary
SS10	The Frontiersmen Assert Themselves	36	identifying connotations as clues to author's bias
SS11	Nathaniel Bacon's Following	36	identifying connotations as clues to author's bias
SS12	Tough Policy Toward Cuba	37	identifying connotations as clues to author's bias
SS13	Black Artists	39	identifying the main idea by direct statement
SS14	Moving Toward Clean Waters	41	inferring the intended reader and intended effects
SS15	Catholic Schools Face Crisis	43	relating details to main idea
SS16	Unemployed Youth	45	identifying emphases
SS17	Social and Religious Movements of the 19th Century	46	identifying basis for organization

63

The selection...	entitled...	begins on page....	and provides reinforcement in....
SS18.	.Dangers of Nuclear Testing.	.48.	.discriminating facts from opinions
SS19.	.International Radio Broadcasts.	.50.	.inferring author's attitude toward topic
SS20.	.President Nixon: For and Against.	.51.	.comparing divergent texts
SS21.	.Integration	.54.	.comprehending charts and graphs
SS22.	.Relations with China.	.56.	.understanding political cartoons

(CORRECT RESPONSES TO ASSESSMENTS OF COMPREHENSION found on page 57)

Arguments against ratification began with an attack on the Philadelphia convention's unauthorized effort to destroy rather than to amend the Articles of *Confederation*. The proposed Constitution, warned the *anti-Federalists*, was a threat to individual freedom and would destroy the traditional powers of the states. The government it created would possess financial and military power as great as that of any foreign king. The anti-Federalists also called special attention to the absence of a Bill of Rights that would guarantee traditional freedoms of religion, speech, assembly and the press.

The *Federalists* replied that adoption of their proposal was the only way of preventing the breakup of the Union into squabbling factions.....

Assessment of Comprehension

1. The italicized words in this passage are all derived from the same root which literally means

   1. league
   2. leader
   3. stand
   4. free

2. *Federalists* are those who support

   1. strong state governments
   2. an alliance of state governments
   3. a monarchy
   4. a Bill of Rights

3. *Anti-Federalists* are those who are

   1. for a strong central government
   2. against a strong central government
   3. against providing for individual rights
   4. for a strong federal constitution

In 1785, abolitionists had persuaded
forbid the bringing of additional sla
sale. By the same law, the *manumissi*
was made much easier. Previously, wh
strong young slave he had to leave a
town or manor for security to guard a
that the slave, one day, might become
when the master granted his slave's f
slave was still dependent on the *exec*
carried out the will, to provide secu

Assessment of Compreh

1. *Manumission* means

   1. to forbid additional slaves t
   2. to free a person from slavery
   3. to become a public charge
   4. the same as abolitionist

2. An *executor* is

   1. one who carries out the death
   2. one who has been freed from s
   3. a master who grants freedom t
   4. one who carries out the terms

ation began with an attack on the
unauthorized effort to destroy
Articles of *Confederation*. The
rned the *anti-Federalists*, was a
dom and would destroy the
states. The government it
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ng. The anti-Federalists also
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itional freedoms of religion,
press.

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g the breakup of the Union into

of Comprehension

in this passage are all derived
ich literally means

who support

rnments
te governments

those who are

ral government
central government
for individual rights
ral constitution

In 1785, abolitionists had persuaded the state legislature to forbid the bringing of additional slaves into the state for sale. By the same law, the *manumission*, or freeing, of slaves was made much easier. Previously, when a man freed even a strong young slave he had to leave a sum of money with the town or manor for security to guard against the possibility that the slave, one day, might become a public charge. Even when the master granted his slave's freedom in his will, the slave was still dependent on the *executor*, or person who carried out the will, to provide security.

Assessment of Comprehension

1. *Manumission* means

   1. to forbid additional slaves to be purchased
   2. to free a person from slavery
   3. to become a public charge
   4. the same as abolitionist

2. An *executor* is

   1. one who carries out the death sentence
   2. one who has been freed from slavery
   3. a master who grants freedom to his slaves
   4. one who carries out the terms of a will

SS3 LABOR FORCE GROWTH 1/1
SS4 PRESIDENT JACKSON'S VETO 1/1
SS5 WILSON'S NONINVOLVEMENT 1/1

The growth of the labor *force* in the United States has been closely tied to the growth of the population. The percentage of the population considered to be part of the labor *market* has remained stable since 1860, but the number of workers has steadily increased. This growth in the work force has been produced both by natural increase in the population and by immigration from foreign countries.

Assessment of Comprehension

1. In this context, *force* means

    1. energy
    2. conviction
    3. compulsion
    4. combined strength

2. In this context, *market* means

    1. a public place
    2. a commercial selling place
    3. a body of workers
    4. an organization for buying and selling

When Congress passed a bill appropriating money for stock in the Maysville Road Company, President Jackson firmly and successfully *vetoed* it. He pointed out that he was not opposed to interstate projects, but that this one lay entirely within state borders and only an amendment to the Constitution could justify use of federal funds in its behalf. Jackson's action jolted his Western supporters, particularly those in Kentucky. His later approval of interstate measures and his harsh Indian policy, however, did much to soften the blow and to maintain his political popularity.

Assessment of Comprehe

1. To *veto* means to

    1. accept
    2. pass
    3. justify
    4. forbid

....Wilson, and the majority of the Ame
policy of noninvolvement. *Diplomacy, r*
arbitrations were the instruments of Wi
combatants. These he pursued with grea
little success.

Assessment of Comprehen

1. *Diplomacy* means to

    1. arrange matters without arousin
    2. impose one's view upon others
    3. avoid becoming involved in the
    4. encourage combat between countr

2. To negotiate means to

    1. make a unilateral agreement
    2. discuss the terms for an agreem
    3. make an arbitrary decision
    4. sustain conflict between opposi

3. *Arbitration* means

    1. joining a labor union
    2. staging an offensive in battle
    3. encouraging combat between natio
    4. hearing both sides of a dispute

/1
VETC 1/1
ENT 1/1

Force in the United States has
growth of the population. The
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t of Comprehension

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tion could justify use of
lf. Jackson's action jolted
articularly those in Kentucky.
erstate measures and his harsh
id much to soften the blow and
popularity.

Assessment of Comprehension

1. To *veto* means to

    1. accept
    2. pass
    3. justify
    4. forbid

....Wilson, and the majority of the American people, preferred a policy of noninvolvement. *Diplomacy*, *negotiations*, and *arbitrations* were the instruments of Wilsons policy toward the combatants. These he pursued with great idealism, but with little success.

Assessment of Comprehension

1. *Diplomacy* means to

    1. arrange matters without arousing hostility
    2. impose one's view upon others
    3. avoid becoming involved in the affairs of other countries
    4. encourage combat between countries

2. To negotiate means to

    1. make a unilateral agreement
    2. discuss the terms for an agreement
    3. make an arbitrary decision
    4. sustain conflict between opposing parties

3. *Arbitration* means

    1. joining a labor union
    2. staging an offensive in battle
    3. encouraging combat between nations
    4. hearing both sides of a dispute and making a decision

Sporadic English-American fighting continued along the Canadian border, but the result was a *stalemate*. Both sides proved that successful raids could be staged. The Americans burned York (Toronto) in one raid, and the English in turn burned Buffalo. However, neither side was able to capture and hold a city.

Assessment of Comprehension

1. A *stalemate* means

    1. one side has the advantage
    2. neither side has an advantage
    3. the contest is over
    4. fighting was sporadic

The little colony of "Rhode Island and Providence Plantations" was a true *democracy*. It was governed by the free and voluntary consent of all the free inhabitants. Church and State were completely separated, and all men, of whatever belief, might "walk as their conscience persuaded them, every one in the name of his God."

Assessment of Comprehension

1. *Democracy* means to be governed by

    1. a Democrat
    2. a Republican
    3. consent of the people
    4. jurisdiction of a monarch

The Confederation Congress, for all its lack of power and resulting unattractiveness to ambitious politicians, proved itself a noteworthy political *innovator*. Its Land Ordinances of 1785 and 1787 broke new ground in providing for the orderly settlement of the West and the orderly establishment of new state and local governments.

Assessment of Compreh

1. The clue to the meaning of *innova*

    1. orderly settlement
    2. broke new ground
    3. ambitious politicians
    4. orderly establishment

Finally the continuous *impressment* of the *confiscation* of American ships fo in June of 1812, to ask Congress for reluctantly and only after the Britis mistakenly assured him there was no c British policy. What Madison did not policy meetings designed to avert an going on in England. On June 23, 181 conciliatory announcement that she wo ships and seamen, but ironically it w slow *transatlantic* communications, th that America had already declared war earlier.

Assessment of Compreh

1. In this passage *impressment* and *c*

    1. have entirely different meani
    2. must be looked up in a dictio
    3. have similar meanings as reve
    4. mean to kill or destroy

2. The prefix *trans* in the word *tran*

    1. against
    2. between
    3. under
    4. across

ghting continued along the
ult was a *stalemate*. Both sides
could be staged. The Americans
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Comprehension

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Island and Providence
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tely separated, and all men,
alk as their conscience
the name of his God."

Comprehension

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For all its lack of power and
ambitious politicians,
olitical *innovator*. Its Land
roke new ground in providing
the West and the orderly
d local governments.

Assessment of Comprehension

1. The clue to the meaning of *innovator* lies in the phrase

   1. orderly settlement
   2. broke new ground
   3. ambitious politicians
   4. orderly establishment

Finally the continuous *impressment* of American sailors and the *confiscation* of American ships forced President Madison, in June of 1812, to ask Congress for war. Madison did so reluctantly and only after the British minister in Washington mistakenly assured him there was no chance of a change in British policy. What Madison did not know was that even then policy meetings designed to avert an Anglo-American war were going on in England. On June 23, 1812, England made a conciliatory announcement that she would stop seizing American ships and seamen, but ironically it was too late. Because of slow *transatlantic* communications, the British were unaware that America had already declared war on England five days earlier.

Assessment of Comprehension

1. In this passage *impressment* and *confiscation*

   1. have entirely different meanings
   2. must be looked up in a dictionary for their meanings
   3. have similar meanings as revealed in the context
   4. mean to kill or destroy

2. The prefix *trans* in the word *transatlantic* means

   1. against
   2. between
   3. under
   4. across

....Historian Harold U. Faulkner has written that "economic distress, high taxes, and the failure of Governor Berkeley aggressively to prosecute the Indian War, led the frontiersmen and small planters to rise under Nathaniel Bacon, gain possession of the legislature, and pass a series of laws aimed to strengthen the local democracy."

Assessment of Comprehension

1. The vocabulary used in this passage indicates that the author considers Bacon and his companions to be

    1. patriotic
    2. persecuted
    3. greedy
    4. rebellious

Oscar Handlin writes, "Nathaniel Bacon, a gentleman of good family and liberal education, but very ambitious and arrogant.... found himself at odds with the clique around Governor Berkeley. Bacon had land, but wanted more.... he wished an aggressive Indian policy. He drew around him malcontents aggrieved because the country's wealth had been committed into the hands of the men in authority and favor."

Assessment of Comprehension

1. The vocabulary used in this passage indicated that the author considers Bacon and his companions to be

    1. patriotic
    2. persecuted
    3. greedy
    4. rebellious

"This is the policeman-of-the-world concept," Representative Dante B. Fascell said last month, "I don't know of any third countries that have asked for our naval protection in the Caribbean."

Mr. Fascell, a Florida Democrat, is chairman of the House Foreign Affairs subcommittee on Latin America. What he was referring to was a recent secret order from President Nixon that the United States Navy was to "interpose" its ships, at the risk of fighting, between Cuban warships and merchant vessels of friendly countries in danger of being apprehended.

The new order, disclosed on April 12 by The Wall Street Journal in a dispatch from Puerto Rico, United States naval headquarters in the Caribbean, stemmed from a shadowy incident last October when the Aquarius II, a merchantman of Panamanian registry, took part in the shelling of the Cuban coastal town of Sama. The vessel, based in Miami, is owned by Jose de la Torriente, a Cuban exile.

During the incident, Cuban jets had photographed the Aquarius II. And in December, Cuban gunboats went into the Caribbean and forced back to Cuba two more Panamanian-flag merchantmen: the Lyla Express on Dec. 5 and the Johnny Express on Dec. 15. Both also were Miami-based vessels of Panamanian registry, owned this time by four brothers named Babun, Cuban exiles of Lebanese origin.

Whether Cuban authorities compared the photographs and confused the Aquarius II with the Express ships, or whether they had proof, as they claimed, that the Express ships had landed and removed agents for the Central Intelligence Agency, is unclear. The Babun brothers and the State Department both denied C.I.A. involvement.

The tension continued to mount. Cuba said she would have no compunction about attacting vessels under "any flag or camouflage" working for the C.I.A. and carrying out "counter revolutionary" activities in Cuban waters. The State Department announced that henceforth the Nixon Administration would take "all measures under international law" to protect not only American but other ships in the Caribbean from Cuban interference. Since then there have been no further Cuban seizures.

Congress has now begun to demand more information. Apparently the new Nixon rules permit a United States Navy skipper to risk a fight with a Cuban warship menancing man if the skipper has "no knowledge" has been involved in C.I.A.-type activ if he believes there are American citi "take the word" of the merchant captai may turn out to be a Cuban exile or ot involve the United States in a gunfigh Castro's regime.

If, however, a Soviet warship hoves in Cuban ally, the American skipper must headquarters in Norfolk, Va., and awai

The new Nixon rules of engagement, iss with Congress, seemed to leave many th for their obvious political impact.

The Foreigh Ministers of the Organizat met here last month and the United Sta taunting Premier Castro and his sympat its own hemisphere supporters. The Ad obviously tolerating no "nonsense" fro Florida geographically but, this being closer politically. President Nixon's presumably not being lost on the 600,0 exiles living in the United States, of have become voters.

Representative Fascell, whose constitu Cuban exiles, said that "this is the s be taking up here with the O.A.S. Fore there seemed little likelihood the Adm any thing but hostility toward Cuba—a November elections.

Secretary of State William Rogers said phrases to the Foregin Ministers. Cub to hemisphere security; Cuba is still Cuba is still "subverting" is neighbor maintaining "close and active" militar Soviet Union.

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from Cuban interference. Since then
her Cuban seizures.

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nit a United States Navy skipper to risk

a fight with a Cuban warship menancing a "friendly" merchantman if the skipper has "no knowledge" that the merchantman has been involved in C.I.A.-type activities around Cuba, or if he believes there are American citizens aboard. He must "take the word" of the merchant captain—even though the latter may turn out to be a Cuban exile or other national anxious to involve the United States in a gunfight with Premier Fidel Castro's regime.

If, however, a Soviet warship hoves in sight ready to aid its Cuban ally, the American skipper must radio Atlantic Fleet headquarters in Norfolk, Va., and await instructions.

The new Nixon rules of engagement, issued without consultation with Congress, seemed to leave many things unclear except for their obvious political impact.

The Foreigh Ministers of the Organization of American States met here last month and the United States plainly was taunting Premier Castro and his sympathizers and heartening its own hemisphere supporters. The Administration was obviously tolerating no "nonsense" from Cuba, 90 miles from Florida geographically but, this being an election year, much closer politically. President Nixon's aggressiveness was presumably not being lost on the 600,000 anti-Castro Cuban exiles living in the United States, of whom nearly 100,000 have become voters.

Representative Fascell, whose constituency includes many Cuban exiles, said that "this is the sort of issue we should be taking up here with the O.A.S. Foreign Ministers." But there seemed little likelihood the Administration would show any thing but hostility toward Cuba—at least until after the November elections.

Secretary of State William Rogers said as much in time hallowed phrases to the Foregin Ministers. Cuba is still a "menance" to hemisphere security; Cuba is still "exporting revolution" Cuba is still "subverting" is neighbors; Cuba is still maintaining "close and active" military ties with the Soviet Union.

Assessment of Comprehension

1. Which statement below is a fact?

   1. "I don't know of any third countries that have asked for our naval protection in the Caribbean."
   2. "This sort of issue should be taken up with the O.A.S."
   3. The U.S. should abandon its naval base in Cuba.
   4. The Babun brothers hope that Cuba will abandon its ties with the Soviet Union.

2. Which statement is opinion?

   1. Aquarius II took part in shelling a coastal town.
   2. President Nixon is trying to win re-election votes from among Cuban exiles.
   3. Cuba is still maintaining "close and active ties" with the Soviet Union.
   4. One hundred thousand Cuban exiles are eligible to vote in this year's presidential election.

3. An appropriate title for this selection would be

   1. U.S. Plans To Blockade Cuba
   2. Haiti Asks Protection From Cuban Aggression
   3. Nixon's Policy Towards Cuba
   4. Congress Demands New Cuban Policy

4. A recurring issue in American political history suggested in this selection is the

   1. defense of States rights
   2. role of the Secretary of State
   3. resistance to admitting political exiles
   4. struggle between President and Congress over foreign policy

5. In this selection, the Cuban government seems to take the position that

   1. President Nixon ought to be re-elected
   2. the Central Intelligence Agency is active in Cuba
   3. Panamanian ships should be kept out of Cuba
   4. Congressman Fascell is a close friend of the Cuban people

6. According to this article, the Nixon re warships to protect ships of other nati places considerable responsibility upon

   1. the U.S. Ambassador to Cuba
   2. the Central Intelligence Agency
   3. U.S. naval commanders
   4. both houses of Congress

t of Comprehension

w is a fact?

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val protection in the Caribbean."
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rs hope that Cuba will abandon its
viet Union.

pinion?

part in shelling a coastal town.
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ell is a close friend of the Cuban people

6. According to this article, the Nixon regulations allowing U.S. warships to protect ships of other nations in the Caribbean places considerable responsibility upon

   1. the U.S. Ambassador to Cuba
   2. the Central Intelligence Agency
   3. U.S. naval commanders
   4. both houses of Congress

In the 1920's a group of talented Negroes poured their feelings into prose, poetry, art, music, and drama. Their work constituted the Negro Renaissance, or Harlem Renaissance after New York's famous Negro district where this artistic movement was centered. During the Harlem Renaissance, white America "discovered" its talented brown citizens and Negro artists rode the crest of popularity. African art became the rage; whites journeyed to Harlem nightclubs to hear jazz; major publishing companies brought out books about Negroes written by Negroes, plays about Negroes, starring Negroes, appeared on Broadway; Negro and white scholars begin serious studies of Negro life. It was truly a renaissance.

The roots of the Harlem Renaissance can be found in the literary interest in the Negro that developed before and during World War I. The Harlemites received considerable support from prominent white writers. Equally important are the postwar factors that contributed to a new self-confidence on the part of the Negro. The postwar Negro was proud, defiant, and bitter—proud of his skin color, defiant toward a country that treated him disdainfully, and bitter at the injustices of the whole Jim Crow system. Consider the exclamation of W.E.B. Du Bois: "Make way for Democracy! We saved it for France, and by the Great Jehovah, we will save it in the U.S.A., or know the reason why."

Pride, defiance, and bitterness were present in the work of the Harlem Renaissance artists. Far more important was the quality of their products, for they were skilled craftsmen in expressing the feelings of the new Negro. Many of these writers, however, were not solely interested in race. The standard of artistic quality was just as important to them as their white counterparts; they wished to be judged as poet, artist, or novelist—not as *Negro* poet, *Negro* artist, or *Negro* novelist.

The career of Langston Hughes, poet and novelist, gives an insight into this artistic movement. Of Negro, Indian and white ancestry, Hughes was born in Joplin, Missouri, in 1902. His youth was spent moving from one place to another: Kansas, Mexico, Illinois, and finally Cleveland, Ohio. He met Jim Crow life in one part of the country, ghetto life in another. Hughes knew the full meaning of being a Negro in white America. Indeed his experiences gave him a broad view of life itself. At various times, Hughes was a seaman, tutor of English in Mexico, doorman, cook in Paris nightclubs, clerk, and college student. Through all of these experiences, he refined his skill as a poet. He had written his first poem after he was elected "class poet" in

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Assessment of Compreh

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   2. the Reconstruction
   3. World War I
   4. the Great Depression

2. The Harlem Renaissance is best des

   1. a growing social mobility of n
   2. increasing job opportunities d
      Twenties"
   3. a movement of black writers fr
      to study
   4. an outpouring of Negro talent
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3. In the quotation "Make way for Dem
   France...," W.E.B. Du Bois is allu

   1. contributions of black people
   2. Negro successes as politicians
   3. the success of Democracy in Fr
      United States
   4. the defense of the Jim Crow sy

4. Which point of view does the autho
   among Langston Hughes' classmates?

   1. racial discrimination does not
   2. people with dark skins work be
   3. blacks have a strong sense of
   4. non-whites have trouble holdin

From THE BLACK MAN IN AMERICA by Larr
1964, 1971 by Scott, Foresman and Com
permission of the publisher.

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Assessment of Comprehension

1. According to this selection, the basis of the Harlem Renaissance was laid before and during

   1. the Civil War
   2. the Reconstruction
   3. World War I
   4. the Great Depression

2. The Harlem Renaissance is best described as

   1. a growing social mobility of non-white New Yorkers
   2. increasing job opportunities during the "Golden Twenties"
   3. a movement of black writers from America to Europe to study
   4. an outpouring of Negro talent centered in New York City

3. In the quotation "Make way for Democracy! We saved it for France...," W.E.B. Du Bois is alluding to

   1. contributions of black people in World War I
   2. Negro successes as politicians
   3. the success of Democracy in France but not in the United States
   4. the defense of the Jim Crow system

4. Which point of view does the author believe was evident among Langston Hughes' classmates?

   1. racial discrimination does not exist outside the South
   2. people with dark skins work better in warm clothes
   3. blacks have a strong sense of rhythm and music
   4. non-whites have trouble holding jobs

From THE BLACK MAN IN AMERICA by Larry Cuban. Copyright c 1964, 1971 by Scott, Foresman and Company. Reprinted by permission of the publisher.

5. The phrase or slogan which most closely matches the apparent mood of many non-whites during the Harlem Renaissance is

   1. Black is beautiful!
   2. Yankee, go home!
   3. Hell no! We won't go!
   4. Two-four-six eight! We ain't gonna integrate!

6. Fully as important as bitterness and defiance in the Harlem Renaissance was the

   1. attraction of many white artists and writers to it
   2. international character of the movement
   3. pride in artistic quality that transcended race
   4. end of racial bigotry in the U.S.

In a rare burst of unanimity, the Senate last month passed, 20 to 0, a bill sponsored by Edmund S. Muskie of Maine that would set 1985 as the deadline for cleansing all the nation's navigable waterways.

The bill aims to achieve this goal largely by giving the Federal Government a predominant role in administering and enforcing clean-up laws. It would take the lead away from state governments and rest it in the hands of the Environmental Protection Administration, a safer distance, it is assumed, from inhibiting local economic and political pressures.

The water clean-up bill may be watered down in the House, where it faces strong pressures from industry, state governments and the Nixon Administration. But in light of the Senate's unanimous approval, something approaching the Muskie measure will eventually emerge from Congress.

What does this mean for the nation's waterways? What, for instance, does it mean for one of the most used and most abused rivers, the wide, majestic and thoroughly filthy Hudson.

The 315-mile long Hudson provides a stern test of water purification intentions and legislation. For 83 years, it has been against the law to discharge pollutants in the Hudson. In the mid-nineteen-thirties, a campaign to clean up the Hudson was launched; another was launched in the mid-fifties, yet another in the mid-sixties. The last, still alive, is part of a statewide pure-waters program backed by a $1-billion bond issue and bearing a promise by Governor Rockefeller of clean-running waters by 1972.

Yet today the Hudson is as dirty as it ever has been. It still serves as an ultimate sewer all the way from its northern reaches, where paper mills spew out milky residues, to the banks of Manhattan.

What promise does the Muskie bill hold for this waterway that has defied so many earlier promises?

Henry Diamond, head of New York State's Environmental Conservation Department, which runs the state's current water clean-up program, thinks the main obstacle to cleanliness is niggardliness, and is skeptical that the Muskie bill would provide anywhere near enough money to fill its own rigid prescriptions.

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Diamond noted recently, "with the Fed
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"They're talking about $14-billion over four years," Mr. Diamond noted recently, "with the Federal Government covering 70 per cent of the cost of municipal sewage treatment. According to the current formulas, New York State gets 8.08 per cent, about $1-billion. A North River treatment plant (for Manhattan) is going to cost $770-million alone. They just haven't matched their environmental rhetoric with the right arithmetic, and it really worries me that the public's aspirations and expectations were raised."

As part of its machinery aimed at making compliance to water clean-up requirements more substantial, the Muskie bill would rely heavily on control by permit. Any industry discharging into a navigable waterway would have to have a Federal permit, which would set rigid conditions and carry stiff sanctions for violation of its terms, fines of $25,000 a day and more. This aspect of the Muskie Bill overlaps the Federal Refuse Act of 1899 and an 1888 measure specifically aimed at the Hudson. Both prohibited water pollution and required permits for discharge into waterways. The Refuse Act has been resuscitated recently, particularly on the Hudson, where the Hudson River Fishermen's Association has fashioned it as an instrument of citizen activism against water pollution, and where the environment-minded United States Attorney, Whitney North Seymour, and his water-pollution chief Ross Sandler, whose jurisdiction reaches from Manhattan almost to Albany, have been particularly aggressive in applying the 72-year-old statute.

This combination has brought 15 indictments under that law, most of them within the last year. And the most dramatic of them surfaced last month. After years of washing out copper fragments from its wire-making plant at Hastings-on-Hudson, Anaconda was fined $220,000 under the 1899 act on a hundred-count indictment, covering the first five months of this year. The fine is by far the largest under the 1899 law—and it seems to have had a good effect. Anaconda has already installed settling tanks to remove the copper from its discharges into the Hudson.

Assessment of Comprehension

1. The author of this selection is attempting to make the reader feel that

   1. the pollution problem in the Hudson River is nearly solved
   2. Congress should not interfere in state matters
   3. vigorous enforcement of existing laws may help more than new laws
   4. efforts to clean up the Hudson River are likely

2. A reader of this selection might infer that the author

   1. is unsympathetic to Environmental Commissioner Henry Diamond
   2. has doubts about ever cleaning up the Hudson River
   3. is bitterly opposed to any policies of Governor Rockefeller
   4. is a strong supporter of Senator Edmund Muskie

3. The word *resuscitated* in this selection means

   1. reconsidered
   2. abolished
   3. polluted
   4. revived

4. The Hudson River Fishermen's Association has fought pollution by

   1. limiting the daily fishing limits
   2. lobbying for the Muskie bill
   3. starting court actions under existing laws
   4. seeking the repeal of the Con Edison permit

5. It might be concluded from this selection that

   1. a combination of approaches must be used to end water pollution
   2. financing antipollution measures is only a minor problem
   3. the Hudson River pollution problem is limited to the area around New York City
   4. the Muskie bill represents the first effort to clean up the Hudson River since 1899

6. The reader of this selection might infe

   1. pollution has been curbed in the Un
   2. inhabitants of industrialized natio
   3. Senator Muskie will be easily elect
   4. Americans have been successful in c since 1899

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6. The reader of this selection might infer that

1. pollution has been curbed in the United States
2. inhabitants of industrialized nations face similar problems
3. Senator Muskie will be easily elected President of the U.S.
4. Americans have been successful in combating pollution since 1899

A year ago, the former secretary of education for the Archdiocese of New York warned that the Catholic school system of the United States could be destroyed "from within" by the very persons who teach and administer in them. Msgr. George A. Kelly, a professor in contemporary Catholic problems at St. John's University, cited "some priests, some Brothers, and some Sisters" of the Catholic teaching orders, who would pull their religious communities out of Catholic education, to meet new and different challenges.

Last week, the archdiocese of New York's school system — with 192,861 students spread over 10 counties, the fourth largest Catholic system in the country — was indeed threatened "from within," but from another source. The Federation of Catholic Teachers, Local 2092, AFL-CIO, representing some 1,400 of the 2,800 lay teachers of the archdiocese, struck over wages and pay parity between elementary and high school teachers. The strike closed four schools in Manhattan and the Bronx—where the union's membership is heaviest—and disrupted 110 more of the diocese's 406 schools. F.C.T. is represented in 329 of the schools.

The union's demands seemed hardly exorbitant. Its proposal of a 10-step, $8,500 to $15,400 salary scale would, if granted in full, still leave Catholic school teachers well behind their New York public school counterparts, who receive $9,400 to $16,950 in eight increments. Likewise, high school-grade school pay parity would give Catholic teachers a benefit public school teachers have had since 1947.

The archdiocese, for its part, was not inclined to trumpet its offer of $200 more for elementary teachers, $400 for high school instructors, and $600 for those without degrees. "Everyone is in favor of paying them as good a wage as public school teachers or better," said Msgr. Donald J. Pryor for the Association of Catholic Schools. "It means the caliber of our teachers would be better."

For the archdiocese, however, there is the problem that the money is not there to give. The Catholic school system operates on a deficit that could reach $31.4-million per year by 1972, according to one study. To meet the teachers' full demands would cost $10-million by one estimate, and swell the deficit to the point where, in Monsignor Pryor's words, "certainly one-thrid and perhaps as much as one-half" of the schools would be put out of business.

Immediately threatened would be educ
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Assessment of Com

1. The main idea expressed in this

   1. internal difficulties may br
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   2. lack of public funds may caus
      private education
   3. strikes by teachers are illeg
   4. the Catholic hierarchy is ir
      needs

2. About what percentage of the lay
   York Archdiocese belong to Local

   1. 10
   2. 90
   3. 50
   4. 60

3. How do the dollar demands of the
   pare with salaries in effect in N
   schools?

   1. strikers want eight increment
      schedule
   2. public school teachers earn h
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   3. both salary schedules are abo
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   4. public school teachers have a
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Immediately threatened would be educational services in 80 schools of depressed neighborhoods. These are schools which would qualify for Federal and State aid for services to the poor and underprivileged except for Supreme Court decisions last June barring public funds for church-related schools. They are being kept open at large expense to the archdiocese.

For the time being, however, the burden of a presumed settlement between the archdiocese and the lay teachers will fall on the parishes.

Assessment of Comprehension

1. The main idea expressed in this selection is

   1. internal difficulties may bring an end to Catholic schools
   2. lack of public funds may cause the collapse of private education
   3. strikes by teachers are illegal and unreasonable
   4. the Catholic hierarchy is irresponsible to parish needs

2. About what percentage of the lay teachers in the New York Archdiocese belong to Local 2092 of the F.C.T.?

   1. 10
   2. 90
   3. 50
   4. 60

3. How do the dollar demands of the striking teachers compare with salaries in effect in New York City public schools?

   1. strikers want eight increments in their salary schedule
   2. public school teachers earn higher salaries at step 1 than step 8
   3. both salary schedules are about the same at all steps
   4. public school teachers have a greater salary range in fewer increments

4. By 1972 operational deficits per year for financing Catholic schools could reach

   1. $10 million
   2. $16,950
   3. $31.4 million
   4. $192,861,000

5. The membership of the Federation of Catholic Teachers

   1. is strongest in 329 schools
   2. controls 406 diocesan schools
   3. closed 110 schools in the strike
   4. halted education in four schools during one strike

6. Two of the major issues in this teacher strike were

   1. hours and working conditions
   2. wages and pay parity
   3. tenure and seniority
   4. clerical influence versus professionalism

"It's heartbreaking," said Mrs. Edith Nathan, manager of the state's Summer Jobs for Youth Program. "I've never seen a time when kids were so anxious to get jobs, so willing to work, so keen on doing an honest day's work."

This should be recognized as a danger signal for the United States of America, for no matter how affluent some segments of the population are, and no matter how big the gross national product is, or how many Cadillacs are being sold, or how many people are taking vacations in Hawaii, Bermuda or darkest Africa, if there are depressed areas of the country and if the young people who want to work cannot find summer jobs, watch-out! Tragic events have taken place in nations where the unemployed have become restive. Unlike the elderly, the young will not sit still.

Assessment of Comprehension

1. The major emphasis of this article is that unemployment among youth leads to

   1. complacency
   2. tragedy
   3. happiness
   4. creativity

2. A minor emphasis is placed on

   1. a willingness of youth to work but no jobs are available
   2. the prosperity of America
   3. the availability of summer jobs
   4. the gross national product

3. *Affluent*, as it is used here, probably means

   1. modern
   2. underdeveloped
   3. deprived
   4. prosperous

4. The implication is that the elderl

   1. accept unemployment
   2. fight unemployment
   3. collect unemployment benefits
   4. become restive

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A most remarkable pioneer woman was Dorothea Lynde Dix, a New England gentlewoman who, after teaching for several years in a fashionable girls' school, at the age of 33 began a life-long crusade in favor of the insane. These unfortunates were then largely treated as criminals, 'chained, naked, beaten with rods and lashed into obedience,' as she described their plight in her *Memorial to the Legislature of Massachusetts* (1843). She began, so far as America was concerned, the movement for intelligent and human treatment of the mentally afflicted. This amazing woman—beautiful, naturally timid and diffident—visited all parts of the United States investigating conditions and lobbying for the insane. She was the only New England reformer to penetrate the South, where chivalry gave her a hearing; and, at her urging, public hospitals were established for the insane in nine Southern states between 1845 and 1852. Off then she went to Europe, where the treatment of the insane was almost equally appalling. There Dorothea enlisted the support of the Duke of Argyll and Queen Victoria, and in Rome told Pope Pius IX that the local insane asylum was 'a scandal and disgrace'; and the Pope listened to her and did something about it.

The great breeding ground of mid-century 'isms' was not New England itself, but an area peopled by Yankees in the rolling hills of central New York and along the Erie Canal. These folk were so susceptible to religious revivals and Pentecostal beliefs that their region was called 'The Burned-over District.' Anti-Masonry began there, and the temperance movement was strong. Joseph Smith sojourned at Palmyra, N.Y., and there published *The Book of Mormon* in 1830 and converted Brigham Young. Charles G. Finney, probably the greatest American evangelist, stumped the length and breadth of the state bringing souls to Christ. William Miller, a veteran of the War of 1812, worked out at Hampton, N.Y., the theory that the Second Coming of Christ would take place on 22 October 1843. He founded the Millerite or Adventist sect which persuaded thousands to sell all their goods and, clothed in suitable robes, to await the Second Coming on roofs, hill-tops, and haystacks, which they felt would shorten their ascent to Heaven. Mother Ann Lee (at New Lebanon, N.Y.) and Jemima Wilkinson (at Jerusalem, N.Y.) attempted to sublimate the sexual urges of mankind by founding Shaker and 'Universal Friend' communities on the basis of celibacy. John H. Noyes, on the contrary, sought perfection and catharsis in sexual indulgence at his Oneida Community, which ended as

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Assessment of Comprehe

1. The details in this passage are org

   1. chronology
   2. cause and effect
   3. relevancy to major theme
   4. least significant to most signi

2. Historically, when the author says
   England reformer to penetrate the S

   1. women were unpopular in the Sou
   2. abolitionists had aroused south
      England
   3. the South had a surplus of soci
   4. hostility towards New England d
      colonial times

3. The historic commonality that unifi

   1. religious ferment
   2. economic expansion
   3. women's liberation
   4. social reform

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Oneida Community, which ended as

an arts-and-crafts organization. It seemed appropriate that spirits from the other world seeking means to communicate with this, should have chosen Rochester, metropolis of the Burned-over District. There the Fox sisters' spirit-rappings and table-turnings had the whole country agog in 1848. Out of their performances issued the cult of spiritualism which within ten years had 67 newspapers and periodicals devoted to culling messages from 'angel spheres.' And it was from central New York that a vast swarm of Yankee 'isms' descended on the West like flights of sparrows.

This attitude of 'restless, prying, conscientious criticism,' as Emerson called it, led to a wide variety of reforms. Throughout the Northern states, as well as Maryland and Kentucky, imprisonment for debt was abolished and the rigors of prison life were softened. Flogging as a punishment for white people was outlawed in most of the states, and abolished in the navy in 1850, owing largely to the influence of Dana's *Two Years Before the Mast*. Public and private charitable institutions multiplied.

Assessment of Comprehension

1. The details in this passage are organized on a basis of

   1. chronology
   2. cause and effect
   3. relevancy to major theme
   4. least significant to most significant

2. Historically, when the author says "She was the only New England reformer to penetrate the South...," he means

   1. women were unpopular in the South during this era
   2. abolitionists had aroused southern hostility toward New England
   3. the South had a surplus of social reformers at this time
   4. hostility towards New England dates back into pre-colonial times

3. The historic commonality that unifies this selection is

   1. religious ferment
   2. economic expansion
   3. women's liberation
   4. social reform

4. The Erie Canal region is referred to as "The Burned-over District" because

   1. serious forest fires had decimated the area
   2. economic depression had impoverished the region
   3. religious fervor seemed so intense
   4. opposition to reform efforts was centered in New York State

5. The attitude or feeling the author projects when he says, "It seemed appropriate that spirits from the other world seeking means to communicate with this, should have chosen,..." is

   1. mild irony
   2. sympathy
   3. strong support
   4. hostility

6. A lasting outgrowth of this period in American history was

   1. religious reform
   2. prohibition of alcoholic beverages
   3. improved conditions in treatment of the insane
   4. literary reform

7. The author of this selection seems to have the greatest admiration for

   1. the Fox sisters
   2. Joseph Smith
   3. Jemima Wilkinson
   4. Dorothea Dix

The dictionary defines cavitation as "the rapid formation and collapse of vapor pockets in a flowing liquid." Cavitation was the cause of death for approximately a thousand sea otters in the waters off Amchitka Island in the Aleutians following the nuclear test last November. This loss is ten to fifty times higher than that predicted in the Atomic Energy Commission's environmental impact statement last June or than the even smaller number the A.E.C. estimated immediately after the explosion.

But the real issue that has been raised has far less to do with the number of animals killed or damage done than with the nature of the risk to which the A.E.C. committed the United States at Amchitka. Advocates of the test have taken smug comfort from the fact that the magnitudes of damage were not far higher, that the test did not trigger an earthquake and tidal wave with loss of human life or that radiation did not escape to poison many fish and sea mammals.

Like the larger than expected loss of life among sea otters, these other potential disasters were also risked when the nuclear device was set off. Men do not dwell alone on this planet and their natural environment is not invulnerable to abuse. On the contrary, men are trustees for every other living organism and the biosphere they share is fragile, interdependent, and seriously imperiled. To burn or blow up, to pillage or pollute this planet with its limited quantities of air and water is to offend against life itself.

The whole experiment was a gamble with nature. How many more Amchitkas before the gambler and the victim are one?

Assessment of Comprehension

1. The statement "men are trustees for every other living organism," may be considered

   1. a fact
   2. an untruth
   3. an opinion
   4. indisputable scientific evidence

2. The statement "the loss is ten to
   that predicted in the Atomic Energ
   impact statement..." can be consid

   1. a fact
   2. an untruth
   3. a political opinion
   4. fallacious information

3. This selection was probably wr tte

   1. President Nixon
   2. the Chairman of the Atomic Ene
   3. Vice President Agnew
   4. an ecologist

4. The author of this selection would
   nuclear experiments because

   1. they are too expensive
   2. atomic testing may trigger ear
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   1. a fact
   2. an untruth
   3. a political opinion
   4. fallacious information

3. This selection was probably written by

   1. President Nixon
   2. the Chairman of the Atomic Energy Commission
   3. Vice President Agnew
   4. an ecologist

4. The author of this selection would advocate discontinuing nuclear experiments because

   1. they are too expensive
   2. atomic testing may trigger earthquakes
   3. all life is sacred and important, and nuclear testing risks life
   4. Amchitka is important as a symbol of failure

5. The statements "The major purpose of nuclear tests is to learn more about atomic science," and "Such tests can only benefit mankind,"

   1. are in agreement with the viewpoint of the selection
   2. are rationalizations justifying the Amchitka test
   3. state plain facts instead of opinions
   4. are irrelevant to the selection

One curious aspect of the new isolationist mood among so many Americans is their hostility toward the relatively modest U.S. propaganda apparatus. Ever since it was quite properly disclosed that some funds supporting Radio Free Europe came from the C.I.A., there have been mounting signs of distaste for the very idea of explaining America's viewpoint to citizens of countries where there is no freedom of expression.

Even so worldly a man as Senator Fulbright opposes the idea of rearranging R.F.E. finances on a new basis to secure its continued operations. Radio Liberty, which broadcasts to the U.S.S.R. in seventeen of its many languages, has increasing difficulty in supporting itself. The Voice of America, representing the U.S. Information Agency, faces a thin budget.

These services differ in all aspects save for money trouble. V.O.A. is official and global in concept. Radio Liberty focuses on the Soviet Union's many republics and has transmitters in Lampertheim, West Germany, as well as Spain and Taiwan. R.F.E. has transmitters in Holzkirchen and Biblis, West Germany, and in Portugal, aiming at Russia's East European allies.

It was always ridiculous to pretend that Radio Liberty and R.F.E. had no connection with U.S. Government agencies. Yet, while it was wise to sever links with the C.I.A., it would be folly to terminate operations of these semiprivate propaganda enterprises.

The intensity of these endeavors seems to confirm the broadcasts effectiveness. More than half the adults of Poland, Rumania, Hungary, Czechoslovakia and Bulgaria listen to R.F.E. Almost 30 million radios in the U.S.S.R. are capable of receiving Radio Liberty's shortwave braodcasts.

It is difficult to understand what is wrong with using modern communications to tell people what is going on—people whose own governments prefer to hide or distort the truth. There can never be international understanding without more open excharge of ideas other than those permitted by totalitarian systems.

Sending ideas abroad is not an unwholesome enterprise. Other Western nations engage in similar operations but meet with jamming interference from Soviet and other Communist stations as "indirect imperialist subversion."

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Indian languages, which provoked a pr
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During Khrushchev's regime, the Soviet Union ceased jamming but since his downfall this has been intermittently resumed.

People caught listening to blacklisted stations are subject to punishment and Moscow stubbornly campaigns to stifle foreign transmitters.

Thus Radio Prague specialized in Italian and Spanish programs designed to create unrest among foreign workers in Common Market countries. The U.S.S.R., for its part, has added a copy of R.F.E. to Radio Moscow's regular setup. This is the allegedly nonofficial and independent radio Peace and Progress. If that is an independent enterprise, it is the only one in the Soviet system.

Moreover, its transmissions tend to be far more hostile and unrestrained than those of Radio Moscow itself—especially broadcasts in Chinese, aimed at mainland China, and in Indian languages, which provoked a protest from the New Delhi Government last year. Moscow answered with the excuse that it had no "influence" over the "independent" station.

Moreover, Americans who pretend embarrassment because we are unabashedly engaged in the propaganda business should realize that the transmitters objected to by Moscow and its allies are in fact imitated by them and their imitative broadcasts are 100 per cent official and biased in presentation of news, often deliberately seeking to stir up trouble.

This diplomatic campaign emphasizes West Germany, which is told that harboring stations like Radio Liberty and R.F.E. is a hostile act not consonant with Chancellor Brandt's efforts to achieve detente.

The truth is not a wicked weapon even though it may be dangerous. Surely Western nations, including the U.S.A., have at least as much right to tell their story to muffled populations as Communist stations have to paint their own picture in the free air and press of the democratic world. It is folly for any Americans to have an inferiority complex about telling things as they are.

Assessment of Comprehension

1. The main idea in this selection is best expressed in paragraphs

   1. one and fourteen
   2. two and nine
   3. five and eleven
   4. four and eight

2. The term "new isolationist mood" indirectly alludes to

   1. the support of Radio Free Europe by the Central Intelligence Agency
   2. lack of freedom of expression and thought
   3. criticism of U.S. world involvement
   4. an unrealistic attitude towards Communism

3. If the author were a U.S. Senator, he would probably vote in favor of

   1. limiting excessive powers of the President
   2. withdrawal of U.S. membership from N.A.T.O.
   3. jamming radio programs from the Soviet Union
   4. appropriation of funds for propaganda purposes

4. Which statement supports the author's viewpoint?

   1. "there have been mounting signs of distaste...for explaining America's viewpoint"
   2. "even so worldly a man as Senator Fulbright opposes..."
   3. "more than half the adults of Poland, (etc...) listen to R.F.E."
   4. "during Khruschev's regime, the Soviet Union ceased jamming but since his downfall..."

5. The most suitable title for this selection is

   1. The Cold War Makes Propaganda a Useful Weapon
   2. Truth and Freedom Are Good Partners
   3. Starve the United States Information Agency
   4. Propaganda Broadcasts Are Not All Bad

6. An opposing viewpoint to one offered in

   1. a free nation should use many means
   2. a free society should not propagand
   3. eastern Europeans should be denied
   4. taxpayers money should be used in a

7. A secondary point the author is making

   1. that the C.I.A. should not be invol propaganda
   2. that the promotion of progaganda is
   3. that public funds should be channel programs
   4. that media in which government agen be censored

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s Propaganda a Useful Weapon
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6. An opposing viewpoint to one offered in this selection would be

   1. a free nation should use many means for telling its views
   2. a free society should not propagandize its own views
   3. eastern Europeans should be denied access to news
   4. taxpayers money should be used in any way needed

7. A secondary point the author is making is

   1. that the C.I.A. should not be involved in promoting U.S. propaganda
   2. that the promotion of progaganda is practiced by all nations
   3. that public funds should be channeled into more valuable programs
   4. that media in which government agencies are involved should be censored

HE'S A PERFECTLY DECENT MAN

by Allen Drury

After being around the White House for a while in connection with a book, I have news for the pouting panjandrums of the Righteous Right: their erstwhile hero, Richard Nixon, whom they have now abondoned with some fanfare, is still a perfectly decent and well-meaning man who deserves the same tolerance and the same chance as anybody else in trying to solve the problems of this complex and uneasy land.

The decision to abandon him (or "suspend support," as they put it), was announced with due solemnity by the Moody Elves of the Miffed Minority. It has had all the impact of a thunderclap in a cannon factory. Presumably it was intended to drive millions of sensible conservatives screaming into the night, leaving poor Richard alone. Instead it would appear to have isolated the Moody Elves.

What is all this hysteria, anyway?

It is true that the President has gone rather far in some more "liberal" directions than some more "conservative" supporters would like to see him go. It is true that in his welfare programs he would appear to be appropriating many of the long-held positions of his Democratic opposition. It would appear further that in foreign affairs and national defense, he may now be taking risks that could conceivably turn black hair white.

But note this: they *are* risks and he knows it—and being Richard Nixon, he is perfectly capable of shifting strategies overnight if he decides his course is wrong or really dangerous.

Again, it is true that there appear to be occasions on which this supreme flexibility is used for political ends, specifically directed toward re-election in 1972. But or the whole this charge is really not so grave. The gravity would come if what he does really, seriously, irrevocably and beyond recall endangers the country to the point where it cannot recover.

There would appear to be little in the Nixon record to warrant this conclusion. All that appears is a great

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The point is: right here and now, we just don't know. It is still too early to tell. We do know that he is far from the villain pictured by his critics on the left; far from the perfect hero pictured by his idolators on the right; and certainly far from the rather sinister target of the Moody Elves.

He is, in fact, a human being who is doing the best he can, and doing so, we must presume, patriotically and as intelligently and diligently as he knows how. Unless we have absolute proof to the contrary, it seems a little early and a little ridiculous to abandon him.

Therefore the hysterical reactions of the Miffed Minority seem premature. There's plenty to worry about in what he's up to, Lord knows—but isn't it a trifle early to be so positive about what it is?

He is, for instance, going to China, barring some slip-up in travel plans. It can be argued that in the sense of Oriental "face," he is going hat-in-hand as supplicant. But is he so stupid that he doesn't know this? Obviously he believes that whatever the risks they are worth taking.

And if he fails and comes home to give us a Winston Churchill batten-down-the-hatches-things-are-tough-all-over speech, then he will at least have cleared the air and his service to America will be very great.

The same applies to national defense, an area in which, it is true, there are many distrubing trends that appear to be adding up to a steady and perhaps irreversible increase in Soviet advantage. But unless a President is certifiably a traitor or an idiot, we have to assume that he knows what he is doing and that he will not knowingly sacrifice the safety and security of the United States of America.

HE'S A DICTATOR AND DEMAGOGUE

by Cyrus Eaton

To one who has survived all the financial panics of this century, has known all the Presidents and has been privileged to participate in building up American industry and agriculture, the disgrace of the dollar in world financial centers is sobering.

Who has the main responsibility for this economic debacle?

In effect we have a Presidential dictatorship sustained by the greatest propaganda machine in history: nationwide prime-time television. The President ignores Congress, rarely consults his Cabinet, bypasses the United Nations and announces his decisions over the air to the unsophisticated. In contrast to democracies such as Britain and Canada where members of cabinets must be either Members of Parliament or the Upper House, and where Premiers and their advisers are always available for public questioning by their fellow elected representatives, American enterprises are carried by our President in secrecy except for several cronies in the pertinent departments.

The President has determined our disastrous financial policies and international relations. As Commander in Chief of the armed forces, a position of power strangely out of place in a democracy, especially in this nuclear age when one man's fanaticism could end the human race, he carries on illegal foreign wars with the aid of thousands of spies in all nations.

Three Wall Street lawyers, Nixon, Mitchell and Rogers, are spending the taxpayers' money around the world like drunken sailors. Now without warning, advice or consent, let alone consultation, they have overnight adopted sensational policies offensive to all other nations. These lawyers have no inventories to liquidate, they have lucrative Wall Street practices waiting.

But many American corporations will have to struggle against the crushing burden of taxation, the high cost of money, and formidable competition from foreign corporations that have been subsidized by American funds.

The most obvious move to help the dol
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Future historians may use such epithe
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No other man I have met has such an a
standing of Richard Nixon as Premier
Vietnam. He said to me: "There will
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Assessment of Compre

1. In Mr. Drury's article, the Moody

    1. liberal Democrats
    2. the President's Cabinet
    3. ultraconservative persons
    4. hopeful presidential candidat

2. Mr. Eaton begins his attack on Pr

    1. problems in Vietnam
    2. economic difficulties
    3. the need for tax reform
    4. labor relations

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The most obvious move to help the dollar is to cut out the expense of maintaining American troops, wives and children in the style to which they have become accustomed all over the world.

Future historians may use such epithets as dictator and demagogue to describe the President. Philosophers may assess his intellectual depth in terms of his association with Billy Graham, for while scientists and astronomers seek an answer to the riddle of the universe, Mr. Nixon apparently accepts—or wishes to give that impression—Dr. Graham's naive theory on the origin and destiny of man.

No other man I have met has such an accurate and complete understanding of Richard Nixon as Premier Pham Van Dong of North Vietnam. He said to me: "There will be no end to the war in Vietnam while Mr. Nixon is President. He will use many pretexts for renewed military attacks on us. The war will end only when Congress refuses to provide the money for further participation."

Assessment of Comprehension

1. In Mr. Drury's article, the Moody Elves are

    1. liberal Democrats
    2. the President's Cabinet
    3. ultraconservative persons
    4. hopeful presidential candidates

2. Mr. Eaton begins his attack on President Nixon by emphasizing

    1. problems in Vietnam
    2. economic difficulties
    3. the need for tax reform
    4. labor relations

3. The only criticism of President Nixon that Mr. Drury accepts is

   1. some of Mr. Nixon's moves are for political ends
   2. the President is splitting the Republican Party
   3. obstinancy makes the President stay with unpopular positions
   4. President Nixon should not seek a second term

4. The criticism of Mr. Nixon which Mr. Eaton repeats throughout his article is

   1. the President's religious beliefs
   2. excessive monopoly of prime-time television
   3. the President's trip to Asia
   4. loss of confidence in the U.S. dollar

5. Concerning the two articles, which of the following is true?

   1. Each fully supports his main contention with ample factual evidence.
   2. Both attack and defend the same features of the President.
   3. Neither relies on extensive documentation of facts.
   4. Each agrees that the President needs more time before criticizing him.

6. Which quote is more critical of the structure of theory of American government than of the President himself?

   1. "All that appears is a great willingness to experiment"
   2. "In contrast to democracies such as Britain... where members of Cabinets... are always available for 'questioning'"
   3. "It is true that the President has gone rather far in some... directions than 'conservative' supporters..."
   4. "Future historians may use such epithets as dictator and demagogue to describe the President"

7. Both writers see as a major contemporary concern

   1. the President's foreign policy in Asia
   2. the problem of illicit drug usage
   3. the reduction of soldiers' dependents living overseas
   4. the association by the President with Billy Graham

8. Mr. Drury would probably consider of President Nixon as being too

   1. liberal
   2. factual
   3. sympathetic
   4. emotional

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8. Mr. Drury would probably consider Mr. Eaton's criticisms of President Nixon as being too

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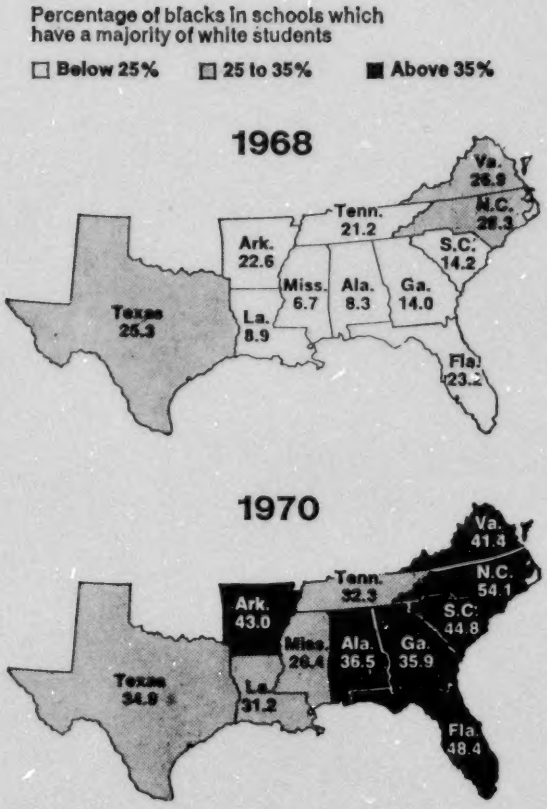
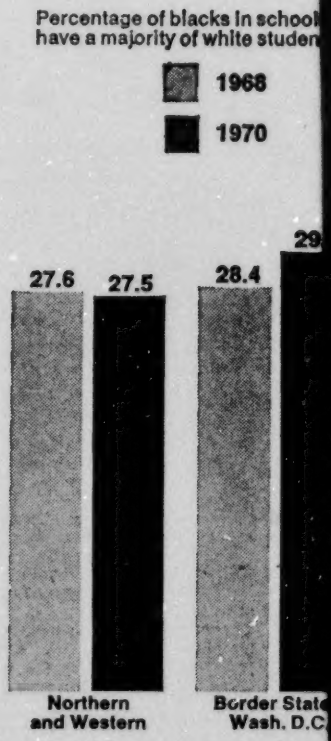


Illustration 1



Illustratio

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of white students

25 to 35% Above 35%

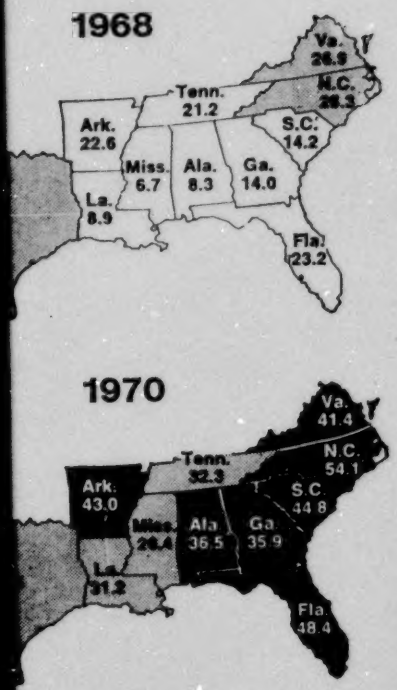

Illustration 1

Percentage of blacks in schools which have a majority of white students

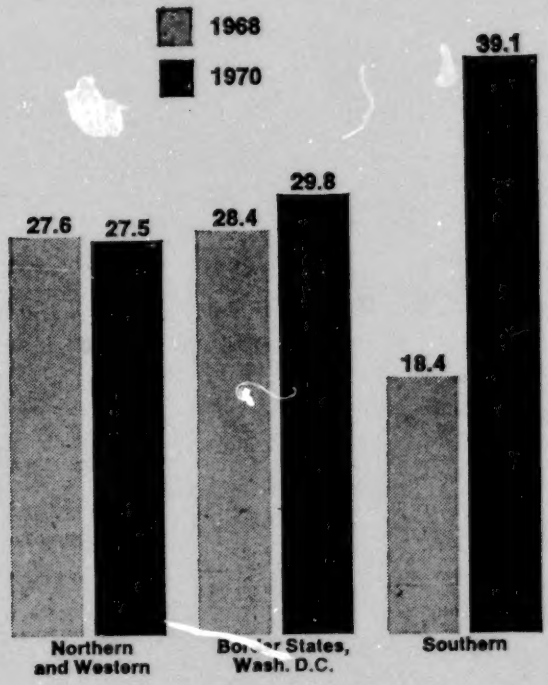

Illustration 2

Assessment of Comprehension

1. Which statement is supported by the illustrations?

   1. School integration remained almost unchanged in the South between 1968 and 1970.
   2. Except in the South, school integration made rapid progress throughout the Nation between 1968 and 1970.
   3. The entire Nation saw remarkable advances in school integration rates between 1968 and 1970.
   4. School integration made significant progress in the South between 1968 and 1970.

2. Illustration 1 indicates which state made the least advances in school integration between 1968 and 1970?

   1. Tennessee
   2. Virginia
   3. Texas
   4. North Carolina

3. According to illustration 1 which state nearly quadrupled its percentage of blacks in schools with white majorities between 1968 and 1970?

   1. Mississippi
   2. South Carolina
   3. Arkansas
   4. Georgia

4. One interpretation of the data shown in illustration 2 for the Northern and Western states is that

   1. these states refuse to integrate their schools
   2. more people live in these states than all the rest combined
   3. reduction of segregation in these regions would not show dramatic changes
   4. bussing has not been an issue in these areas of the United States

5. According to these illustrations, integration up to 1968 was appare

   1. New York, Michigan, Californi
   2. Texas, Arizona, New Mexico
   3. Maryland, Virginia, Kentucky
   4. Mississippi, Alabama, Louisia

6. In spite of considerable change, supported by the illustrations?

   1. School segregation has ended schools in the United States.
   2. North Carolina is significant average in integration progre
   3. Racial segregation in the pub United States will end by 198
   4. Integration in southern state rest of the Nation.

t of Comprehension

ported by the illustrations?

remained almost unchanged in the
and 1970.
n, school integration made rapid
t the Nation between 1968 and 1970.
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between 1968 and 1970.
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and 1970.

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ks in schools with white majorities

the data shown in illustration 2
estern states is that

e to integrate their schools
n these states than all the rest

gation in these regions would not
ges
en an issue in these areas of the

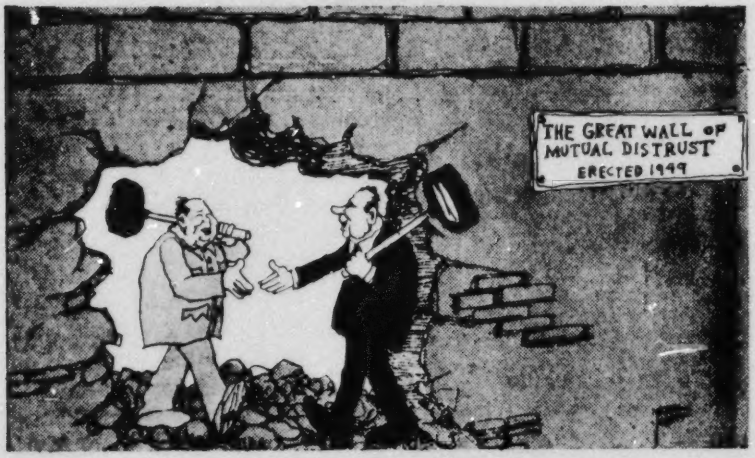
5. According to these illustrations, resistance to integration up to 1968 was apparently strongest in

   1. New York, Michigan, California
   2. Texas, Arizona, New Mexico
   3. Maryland, Virginia, Kentucky
   4. Mississippi, Alabama, Louisiana

6. In spite of considerable change, which conclusion is supported by the illustrations?

   1. School segregation has ended in over 50% of the schools in the United States.
   2. North Carolina is significantly ahead of the national average in integration progress.
   3. Racial segregation in the public schools in the United States will end by 1980.
   4. Integration in southern states still lags behind the rest of the Nation.

Cartoon A



"Welcome Back!"

Cartoon B

"This will be clearer, but you'll probably see double."

Assessment Of Compreh

1. Cartoons A and B reflect U.S. policy c

   1. Europe
   2. Asia
   3. the Middle East
   4. Latin America

2. The figures greeting each other in Car

   1. President Nixon and Chairman Mao
   2. Premier Kosygin and President Nixo
   3. former President Eisenhower and Ch
   4. leaders of the European Common Mar

3. Cartoon B is alluding to

   1. a short-sighted foreign policy by
   2. U.S.-Japanese relations over Okina
   3. U.S. dealings with Nationalist and
   4. U.S. opposition to admission of Ch

4. The figure seated in the chair in Cart

   1. elderly Americans
   2. the United States
   3. the Chinese people
   4. the Republican Party

5. Both cartoons reflect

   1. criticism of President Nixon
   2. approval of President Nixon
   3. opposition to changing U.S. polici
   4. a need to reappraise U.S. policy i

6. The sign in Cartoon A alludes to the

   1. breakdown in U.S.-China relations
   2. erection of the Berlin Wall separa
   3. ancient wall between China and the
   4. end of poor relations between Comm

Cartoon A

"Welcome Back!"

Cartoon B

r, but you'll probably see double."

Assessment Of Comprehension

1. Cartoons A and B reflect U.S. policy changes in 1971-72 involving

   1. Europe
   2. Asia
   3. the Middle East
   4. Latin America

2. The figures greeting each other in Cartoon A are supposed to be

   1. President Nixon and Chairman Mao
   2. Premier Kosygin and President Nixon
   3. former President Eisenhower and Chiang Kai-shek
   4. leaders of the European Common Market

3. Cartoon B is alluding to

   1. a short-sighted foreign policy by the United States
   2. U.S.-Japanese relations over Okinawa
   3. U.S. dealings with Nationalist and Communist China
   4. U.S. opposition to admission of China to the United Nations

4. The figure seated in the chair in Cartoon B represents

   1. elderly Americans
   2. the United States
   3. the Chinese people
   4. the Republican Party

5. Both cartoons reflect

   1. criticism of President Nixon
   2. approval of President Nixon
   3. opposition to changing U.S. policies
   4. a need to reappraise U.S. policy in Vietnam

6. The sign in Cartoon A alludes to the

   1. breakdown in U.S.-China relations since World War II
   2. erection of the Berlin Wall separating east and west Berlin
   3. ancient wall between China and the barbarians to the North
   4. end of poor relations between Communist China and the U.S.S.R.

SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11
1. (1)	1. (2)	1. (4)	1. (4)	1. (1)	1. (2)	1. (3)	1. (2)	1. (2)	1. (1)	1. (3)
2. (2)	2. (4)	2. (3)		2. (2)				2. (4)		
3. (2)				3. (4)						

SS12	SS13	SS14	SS15	SS16	SS17	SS18	SS19	SS20	SS21	SS22
1. (1)	1. (3)	1. (3)	1. (1)	1. (2)	1. (3)	1. (3)	1. (1)	1. (3)	1. (4)	1. (2)
2. (2)	2. (4)	2. (2)	2. (3)	2. (1)	2. (2)	2. (1)	2. (3)	2. (2)	2. (3)	2. (1)
3. (3)	3. (1)	3. (4)	3. (4)	3. (4)	3. (4)	3. (4)	3. (4)	3. (1)	3. (1)	3. (3)
4. (4)	4. (3)	4. (3)	4. (3)	4. (4)	4. (3)	4. (3)	4. (3)	4. (4)	4. (3)	4. (2)
5. (2)	5. (1)	5. (1)	5. (4)		5. (1)	5. (2)	5. (4)	5. (3)	5. (4)	5. (2)
6. (3)	6. (3)	6. (2)	6. (2)		6. (3)		6. (2)	6. (2)	6. (2)	6. (1)
					7. (4)		7. (1)	7. (1)		
								8. (4)		

1. (4)	11. (4)	21. (4)	31. (1)	41. (4)
2. (1)	12. (1)	22. (3)	32. (3)	42. (2)
3. (1)	13. (4)	23. (4)	33. (3)	43. (2)
4. (3)	14. (4)	24. (2)	34. (4)	44. (3)
5. (2)	15. (4)	25. (2)	35. (2)	45. (1)
6. (3)	16. (2)	26. (3)	36. (4)	46. (4)
7. (2)	17. (3)	27. (1)	37. (2)	47. (3)
8. (1)	18. (3)	28. (2)	38. (4)	48. (3)
9. (3)	19. (2)	29. (1)	39. (4)	49. (2)
10. (2)	20. (1)	30. (2)	40. (1)	50. (2)

1. A man measures his living room floor and finds it to be 12 feet by 15 feet. The square yards of carpeting he would need for this room are

   1. 9
   2. 12
   3. 15
   4. 20

2. Wood paneling is cut into 7 in. and 5 in. widths. When paneling a 14 ft. wall, a person must use

   1. 14 pieces of each type of board
   2. 20 pieces of 7 in. board
   3. 28 pieces of 5 in. board
   4. 10 pieces of 7 in. board and 14 pieces of 5 in. board

3. A person makes $100 a week gross salary. Taxes and other deductions total 20 percent of his pay. Household expenses total $30, food costs are $30, a total of $10 is set aside for miscellaneous expenses, and $5 goes into a savings account. How much does he have left?

   1. $5
   2. $10
   3. $20
   4. $25

4. At the end of one year, a $2,000 savings certificate earning 6 percent interest per year would be worth

   1. $2,012
   2. $2,060
   3. $2,120
   4. $2,333

5. A kitchen floor has an area of 120 square feet. How much would it cost to tile the floor if each 12 in. by 12 in. tile cost 60 cents?

   1. $20
   2. $72
   3. $120
   4. $144

6. At the end of June, Mr. Smith's ch
   $366.87 balance. During July Mr.
   the following amounts: $24.30, $1
   $16.78. During July Mr. Smith dep
   into his account. His balance at

   1. $723.64
   2. $356.77
   3. $270.85
   4. $10.10

7. A woman sends her husband to the s
   milk which costs 26 cents. He ret
   frozen pizza, a wedge of cheese wh
   six-pack of soda which cost 99 ce
   chips for 69 cents, a bag of pretz
   one quart of milk. His total bill

   1. $4.93
   2. $5.19
   3. $5.81
   4. $6.07

8. Elaine's favorite recipe calls for
   and 1/4 cup of raisins. If she dou
   would need

   1. 5 cups of flour and 1/2 cup of
   2. 1 1/4 cups of flour and 1/8 cup
   3. 1/2 cup of flour and 5 cups of
   4. 1/8 cup of flour and 1 1/4 cups

9. A five pound bag of hamburger is on
   cost per pound is

   1. $3.55
   2. $.50
   3. $.71
   4. $17.75

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oes he have left?

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terest per year would be worth

an area of 120 square feet. How much
e the floor if each 12 in. by 12 in.

6. At the end of June, Mr. Smith's checking account had a $366.87 balance. During July Mr. Smith wrote checks for the following amounts: $24.30, $141.60, $7.36, $35.98, and $16.78. During July Mr. Smith deposited a total of $130 into his account. His balance at the end of July was

   1. $723.64
   2. $356.77
   3. $270.85
   4. $10.10

7. A woman sends her husband to the store for a quart of milk which costs 26 cents. He returns home with a $1.98 frozen pizza, a wedge of cheese which cost 88 cents, a six-pack of soda which cost 99 cents, a bag of potato chips for 69 cents, a bag of pretzels for 39 cents, and one quart of milk. His total bill was

   1. $4.93
   2. $5.19
   3. $5.81
   4. $6.07

8. Elaine's favorite recipe calls for 2 1/2 cups of flour and 1/4 cup of raisins. If she doubles her recipe, she would need

   1. 5 cups of flour and 1/2 cup of raisins
   2. 1 1/4 cups of flour and 1/8 cup of raisins
   3. 1/2 cup of flour and 5 cups of raisins
   4. 1/8 cup of flour and 1 1/4 cups of raisins

9. A five pound bag of hamburger is on sale for $3.5[illegible]. The cost per pound is

   1. $3.55
   2. $.50
   3. $.71
   4. $17.75

10. A man has a 6 foot by 9 foot floor area to cover; he can purchase

    (a) 12 in. x 12 in. floor tiles at 80 cents each
    (b) 12 in. x 12 in. carpet tiles at 90 cents each
    (c) linoleum which costs $6 a sq. yd.
    (d) a carpet which normally costs $40 but is on sale for 10 percent off its list price

    Which two choices would cost the same?

    1. a and b
    2. c and d
    3. a and c
    4. b and d

11. The John Doe Company charges its customers 1.5 percent per month on the unpaid balance of their charge accounts. The yearly interest rate would be

    1. 1.5 percent
    2. 8 percent
    3. 12 percent
    4. 18 percent

12. A worker receives a raise in salary of 12 cents per hour. In a 40-hour work week, his gross salary will increase by

    1. $4.80
    2. $12
    3. $40
    4. $48

13. A pound of margarine usually contains four individual sticks of margarine. Many brands have on the wrapper of each stick markings which indicate how to divide the stick into eight sections, each section measuring one tablespoon. If a recipe called for four tablespoons of margarine, the amount used would be

    1. 1 lb.
    2. 1/2 lb.
    3. 1/4 lb.
    4. 1/8 lb.

14. How many minutes are there in a day?

    1. 12
    2. 24
    3. 60
    4. 1,440

15. A person earning $220 per week gross s
    6 percent cost of living raise plus a
    week increase in salary. His gross s
    is

    1. $230
    2. $233
    3. $243.80
    4. $243.20

16. The price of roast beef is $1.65 per
    roast costs

    1. $.33
    2. $8.25
    3. $1.65
    4. $6.50

17. A man needs two tires for his automob
    X and brand Y both cost $50 per tire.
    30 percent off the normal price while
    50 percent off the normal price of th
    customer pays full price for the firs
    man's need, he should purchase

    1. one brand Y tire
    2. one brand Y tire and one brand X
    3. two brand X tires
    4. two brand Y tires

18. A family takes a 210-mile trip which
    complete. Their average speed was

    1. 210 m.p.h.
    2. 5 m.p.h.
    3. 42 m.p.h.
    4. 1,050 m.p.h.

t by 9 foot floor area to cover; he

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ount used would be

14. How many minutes are there in a day?

1. 12
2. 24
3. 60
4. 1,440

15. A person earning $220 per week gross salary receives a 6 percent cost of living raise plus an additional $10 per week increase in salary. His gross salary after the raise is

1. $230
2. $233
3. $243.80
4. $243.20

16. The price of roast beef is $1.65 per pound. A five-pound roast costs

1. $.33
2. $8.25
3. $1.65
4. $6.50

17. A man needs two tires for his automobile. He finds brand X and brand Y both cost $50 per tire. Brand X is on sale for 30 percent off the normal price while brand Y is on sale for 50 percent off the normal price of the second tire when the customer pays full price for the first tire. In light of the man's need, he should purchase

1. one brand Y tire
2. one brand Y tire and one brand X tire
3. two brand X tires
4. two brand Y tires

18. A family takes a 210-mile trip which takes them five hours to complete. Their average speed was

1. 210 m.p.h.
2. 5 m.p.h.
3. 42 m.p.h.
4. 1,050 m.p.h.

19. There is a 1 cent sale at the pharmacy. At this time a customer can purchase two items which are exactly the same, paying full price for one and 1 cent for the other. A person buys two tubes of toothpaste which normally cost $1.19 each and two bottles of aspirin which normally cost 98 cents each. The amount of money this person saves by taking advantage of this 1 cent sale is

1. $2.19
2. $2.15
3. $4.34
4. $6.53

20. How long would it take an airplane flying at an average speed of 600 m.p.h. to travel 3,000 miles?

1. 5 hrs.
2. 20 hrs.
3. 2 hrs.
4. 50 hrs.

21. A carload of boxes was received at the mill. George unpacked 1/3 of them, Sam carried out 1/2 of the shipment, and Pete managed to move 1/6 of the load. How much of the shipment was left to unpack?

1. 1/2
2. 1/3
3. 1/6
4. 0

22. Michael bought a bar of soap for 11 cents and a tube of toothpaste for 43 cents. He gave the clerk a dollar. His change totals

1. 11 cents
2. 43 cents
3. 46 cents
4. 54 cents

23. A doctor tells his patient that he and puts him on a diet that will e in a 20 percent reduction in weigh should plan to lose

1. 200 lbs.
2. 176 lbs.
3. 20 lbs.
4. 44 lbs.

24. A carpenter built a counter top fr lumber that he had left over. The 2.5 ft., 3.7 ft., and 2.6 ft. in l length of the counter top was

1. 2.9 ft.
2. 8.8 ft.
3. 26.4 ft.
4. 7.18 ft.

25. There were 36 donuts left from the hostesses decided to take them hom and Jane took 1/3 of the donuts. left for Carol?

1. 36
2. 15
3. 12
4. 9

26. The basic list price of an automob optional equipment lists for $1,000 offers Mr. Smith the optional equip off the list price. He tells Mr. S a $100 preparation charge and that cent sales tax on the selling price car costs Mr. Smith

1. $1,177
2. $3,115.50
3. $3,584.50
4. $4,387

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o unpack?

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cents. He gave the clerk a dollar. His

23. A doctor tells his patient that he weighs 220 lbs. and puts him on a diet that will eventually result in a 20 percent reduction in weight. The patient should plan to lose

1. 200 lbs.
2. 176 lbs.
3. 20 lbs.
4. 44 lbs.

24. A carpenter built a counter top from three pieces of lumber that he had left over. The pieces measured 2.5 ft., 3.7 ft., and 2.6 ft. in length. The total length of the counter top was

1. 2.9 ft.
2. 8.8 ft.
3. 26.4 ft.
4. 7.18 ft.

25. There were 36 donuts left from the party. The three hostesses decided to take them home. Sue took 1/4 and Jane took 1/3 of the donuts. How many donuts were left for Carol?

1. 36
2. 15
3. 12
4. 9

26. The basic list price of an automobile is $3,000. The optional equipment lists for $1,000. The car dealer offers Mr. Smith the optional equipment for 75 percent off the list price. He tells Mr. Smith that he must pay a $100 preparation charge and that he must pay a 7 percent sales tax on the selling price of the car. This car costs Mr. Smith

1. $1,177
2. $3,115.50
3. $3,584.50
4. $4,387

27. In 1965 a snowmobile dealer sold 32 snowmobiles. In 1970 he sold 384 snowmobiles. The number of machines that he sold in 1965 is what fraction of his 1970 sales?

    1. 1/12
    2. 1/5
    3. 1/32
    4. 1/64

28. Alan Jones toured the country from Butte, Montana, to Albany, New York. He traveled a total distance of 2,610 miles during his 30-day trip. The average distance Alan traveled each day was

    1. 2,610 miles
    2. 87 miles
    3. 78,300 miles
    4. 30 miles

29. If Charlie ate 1/8 of the hamburgers and together Dave and Steven ate 1/4 of the hamburgers, what fraction of the hamburgers remain?

    1. 5/8
    2. 3/8
    3. 1/4
    4. 1/8

30. Ten dozen cookies are needed for a bridal shower. Carol made four dozen and Barbara made two dozen. What percentage must be made by Cathy?

    1. 20%
    2. 40%
    3. 60%
    4. 80%

31. Mr. Dollar, driving his luxury car, t
    504 miles. His car consumed 84 gallo
    miles did Mr. Dollar drive with each

    1. 6
    2. 14
    3. 84
    4. 504

32. Using 84 gallons of gasoline at a cos
    Mr. Dollar's expense for gasoline was

    1. $.36
    2. $3.61
    3. $36.12
    4. $361.20

33. Mr. Brown bought a cord of wood and n
    of his house. Some of the neighborho
    stack the wood. Cathy stacked 5 perc
    Bill 7 percent, Sue 11 percent, Dave
    percent, and Diana 17 percent of the
    job accomplished by the girls was

    1. 26
    2. 32
    3. 42
    4. 74

34. Bill and John took a 532-mile trip.
    trip. How many miles did John drive?

    1. 399
    2. 532
    3. 266
    4. 133

1/6

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d each day was

the hamburgers and together
1/4 of the hamburgers, what
rgers remain?

needed for a bridal shower.
and Barbara made two dozen.
be made by Cathy?

31. Mr. Dollar, driving his luxury car, traveled a distance of 504 miles. His car consumed 84 gallons of gasoline. How many miles did Mr. Dollar drive with each gallon of gasoline?

1. 6
2. 14
3. 84
4. 504

32. Using 84 gallons of gasoline at a cost of 43 cents per gallon, Mr. Dollar's expense for gasoline was

1. $.36
2. $3.61
3. $36.12
4. $361.20

33. Mr. Brown bought a cord of wood and needed it stacked in back of his house. Some of the neighborhood children helped him stack the wood. Cathy stacked 5 percent, John 10 percent, Bill 7 percent, Sue 11 percent, Dave 15 percent, Maryanne 9 percent, and Diana 17 percent of the wood. The percent of the job accomplished by the girls was

1. 26
2. 32
3. 42
4. 74

34. Bill and John took a 532-mile trip. Bill drove for 3/4 of the trip. How many miles did John drive?

1. 399
2. 532
3. 266
4. 133

35. Mark bought an ice chest for $34.95 and a $16.88 lantern. He had to pay $3.11 for the state sales tax. Mark gave the clerk three twenty dollar bills. His change was

    1. $3.11
    2. $5.06
    3. $54.94
    4. $60

36. George earns $3 per hour. If he works more than 40 hours, he gets paid time and a half for the overtime that he puts in. One week George worked 46 hours. His gross pay was

    1. $89
    2. $120
    3. $138
    4. $147

37. An athlete ran the mile in 3 minutes and 52 seconds. The same amount of time measured in seconds is

    1. 180
    2. 232
    3. 55
    4. 17 1/3

38. One day during the summer the sun rose at 5:41 and set at 8:21. The amount of time between sunrise and sunset was

    1. 2 hrs. and 40 mins.
    2. 9 hrs. and 20 mins.
    3. 14 hrs. and 2 mins.
    4. 14 hrs. and 40 mins.

39. The volume of an object is found by multiplying its length times its width times its height. A swimming pool has an average depth of 4 ft., is 25 ft. long and 15 ft. wide. Its volume is

    1. 60 cubic feet
    2. 100 cubic feet
    3. 375 cubic feet
    4. 1,500 cubic feet

40. A volume of 7.5 gallons and a vo
    are about equal. A swimming poo
    cubic feet. The amount of water
    is about

    1. 5,250 gals.
    2. 700 gals.
    3. 93.3 gals.
    4. 7.5 gals.

41. A water bed that measures 7 ft.
    would hold how many cubic feet o

    1. 147.75
    2. 4.75
    3. 95.50
    4. 57.75

42. Bob earns 203.16 a week. His de
    income tax, $30.42; state income
    security tax, $11.51; health insu
    Savings Bond, $10. Bob's take-ho

    1. $65.08
    2. $138.08
    3. $203.16
    4. $268.24

43. A cord of wood measures 4 ft. x 4
    cubic feet are there in half a co

    1. 16
    2. 64
    3. 128
    4. 8

44. Outboard motors that are used to
    a certain amount of oil mixed wit
    running. If 4 ounces of oil per
    required, the amount of oil neede
    line is

    1. 1 ounce
    2. 5 ounces
    3. 20 ounces
    4. 29 ounces

st for $34.95 and a $16.88 lantern.
the state sales tax. Mark gave
dollar bills. His change was

ur. If he works more than 40 hours,
half for the overtime that he puts
orked 46 hours. His gross pay was

e in 3 minutes and 52 seconds. The
sured in seconds is

ner the sun rose at 5:41 and set at
ime between sunrise and sunset was

.
.
.
s.

t is found by multiplying its length
its height. A swimming pool has an
is 25 ft. long and 15 ft. wide. Its

40. A volume of 7.5 gallons and a volume of 1 cubic foot are about equal. A swimming pool has a volume of 700 cubic feet. The amount of water needed to fill the pool is about

1. 5,250 gals.
2. 700 gals.
3. 93.3 gals.
4. 7.5 gals.

41. A water bed that measures 7 ft. x 5 1/2 ft. x 1 1/2 ft. would hold how many cubic feet of water?

1. 147.75
2. 4.75
3. 95.50
4. 57.75

42. Bob earns 203.16 a week. His deductions are: federal income tax, $30.42; state income tax, $6.03; social security tax, $11.51; health insurance, $7.12; U.S. Savings Bond, $10. Bob's take-home pay is

1. $65.08
2. $138.08
3. $203.16
4. $268.24

43. A cord of wood measures 4 ft. x 4 ft. x 8 ft. How many cubic feet are there in half a cord?

1. 16
2. 64
3. 128
4. 8

44. Outboard motors that are used to propel many boats require a certain amount of oil mixed with the gasoline for proper running. If 4 ounces of oil per gallon of gasoline is required, the amount of oil needed for 5 gallons of gasoline is

1. 1 ounce
2. 5 ounces
3. 20 ounces
4. 29 ounces

45. A can of soup costs 18 cents and serves four people. The cost per serving is

    1. 4.5 cents
    2. 10 cents
    3. 18 cents
    4. 72 cents

46. Richard climbed 77 of 156 stairs in a lighthouse. How many stairs must he yet climb to reach the top?

    1. 89
    2. 77
    3. 156
    4. 79

47. The cost of the ingredients of a toasted cheese sandwich is:

    cheese - 4 cents
    bread - 2.5 cents
    butter - 2.5 cents

    A restaurant owner charges his customers 55 cents for each toasted cheese sandwich. His profit is

    1. 9 cents
    2. 55 cents
    3. 46 cents
    4. 64 cents

48. A six-pack of soda costs 99 cents. Each can of soda costs

    1. 99 cents
    2. 6 cents
    3. 16.5 cents
    4. 33.5 cents

49. A gasoline station owner makes a profi
    on regular gasoline and 6 cents per ga
    If he sells 1,900 gallons of regular a
    mium gasoline, his profit is

    1. $96
    2. $191
    3. $175
    4. $210

50. A book has 371 pages which Karen must
    a period of a week, her average daily

    1. 7 pages
    2. 53 pages
    3. 371 pages
    4. 62 pages

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g is

of 156 stairs in a lighthouse.
t he yet climb to reach the top?

reoients of a toasted cheese

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ts

charges his customers 55 cents
eese sandwich. His profit is

costs 99 cents. Each can of

49. A gasoline station owner makes a profit of 5 cents per gallon on regular gasoline and 6 cents per gallon on premium gasoline. If he sells 1,900 gallons of regular and 1,600 gallons of premium gasoline, his profit is

1. $96
2. $191
3. $175
4. $210

50. A book has 371 pages which Karen must read. To do this, over a period of a week, her average daily reading must total

1. 7 pages
2. 53 pages
3. 371 pages
4. 62 pages

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